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GREAT LAKES FORESTRY CENTRE
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Results of forest insect and disease surveys in the NORTHEASTERN REGION of Ontario, 1985

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

M. J. Thomson, E. J. Czerwinski, L. S. MacLeod and S. G. Payne

Miscellaneous Report No. 39

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THE GREAT LAKES FORESTRY CENTRE

The Great Lakes Forestry Centre is one of six regional establishments located across Canada and operated by the Canadian Forestry Service. The overall objective of the Service is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. The Centre pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

Forestry problems are continually assessed by the Canada-Ontario Joint Forestry Research Committee, made up chiefly of senior members of the Centre and the Ontario Ministry of Natural Resources. The Committee ensures that the research resources of both agencies are effectively transmitted to the forest managers in order to improve forest production and protection, and the quality of the environment.

Staff of the forestry development program negotiate and administer federal-provincial cost-sharing agreements with the province of Ontario, conduct economic studies, and implement job creation programs in the forest sector. Again, this requires close cooperation with the Ontario Ministry of Natural Resources and with other provincial and federal agencies concerned with the forest sector.

Close working relations are also maintained by the Centre with educational institutions specializing in forestry and the biological sciences, with the forest industry, and with other forestry organizations in the province.

The Centre recognizes that forested land must be managed in the best public interest, not only for the wood production essential to our economy but also for the recreational purposes that are so important to our social well-being. These goals must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHEASTERN REGION OF ONTARIO, 1985

(FOREST DISTRICTS: WAWA, SAULT STE. MARIE, BLIND RIVER, ESPANOLA, SUDBURY, TEMAGAMI AND NORTH BAY)

M.J. THOMSON, E.J. CZERWINSKI, L.S. MACLEOD AND S.G. PAYNE

GREAT LAKES FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

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SURVEY HIGHLIGHTS

The status of all important forest insects and diseases in the Northeastern Region is presented in the following report. The information within was obtained by ground and aerial surveys.

The area infested by the jack pine budworm increased dramatically for the second consecutive year, causing varying degrees of defoliation through 887,056 ha of forested land, more than double the area infested in 1984. Aerial surveys for spruce budworm revealed a decrease in the area of damage. Over all, the area in which moderate-to-severe defoliation occurred was approximately 1,522,757 ha--a 31% decrease over that recorded the previous year. Populations of the Bruce spanworm were present for the second consecutive year, causing varying degrees of defoliation in hardwood stands through approximately 28,000 ha, a fivefold increase over the area defoliated the previous year. The heaviest defoliation was generally found on understory and regeneration trees. Although there are no known gypsy moth larval populations in the Region, an increase in the distribution of adults was recorded when small numbers of male moths were captured in pheromone traps at five locations in comparison with two locations in 1984.

A marked increase in the distribution of Scleroderris canker was recorded for the second consecutive year when infection centers were found in jack pine and red pine plantations at eight points in the Wawa and Blind River districts. An increase in the distribution and incidence of damage by the western gall rust was evident as well.

A special survey was conducted in plantations of jack pine in specific height classes at 12 locations to determine the incidence and impact of damaging agents common to this tree species.

The pinewood nematode, a pest of pine species, was recorded for the first time in the Region when it was found in two of 46 samples submitted to the Great Lakes Forestry Centre for analysis.

In this report, the following categories are used to describe the importance of insects or diseases.

Major Insects or Diseases

Capable of causing serious injury to or death of living trees or shrubs

*Minor Insects or Diseases**

Capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

* No minor diseases were reported in the Northeastern Region in 1985.

Frontispiece. Top mortality of jack pine (*Pinus banksiana* Lamb.) associated with jack pine budworm, *Choristoneura pinus pinus* Free.

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

(1) those which are of minor importance and have not been known to cause serious damage to forest trees,

(2) those which are capable of causing serious damage but, because of a low incidence or for other reasons, did not cause serious damage in 1985.

Note: Forest districts affected by specific insects or diseases are listed beneath the names of those insects or diseases in the Table of Contents. The assistance and cooperation extended to the authors by the Ontario Ministry of Natural Resources, wood-using industries and private individuals during the 1985 field season are acknowledged.

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INSECTS

Major Insects

Cedar Leafminer, *Argyresthia aureoargentella* Brower

In 1983, severe deterioration of eastern white cedar *(Thuja occidentalis* L.) foliage caused by leafmining occurred throughout an area of about 4,540 ha, stretching from Mills Township east to Hungerford Point on Manitoulin Island, including 570 ha on Fitzwilliam, Rabbit and Wall islands.

High populations in 1984 caused severe foliar damage throughout approximately 3,407 ha of forested land. Aerial surveys revealed damaged cedar stands as far west as Kitchener Island and on the south shore of Manitoulin Island, from Burnt Island east to Hungerford Point. Populations collapsed on Rabbit and Wall islands but recurred on Fitzwilliam Island.

In 1985, high populations recurred in much the same area infested in the previous two years; however, the main concentration of infestations is now further west on the south shore of Manitoulin Island, where it totals some 2,720 ha. Infestations have completely collapsed in the east on Fitzwilliam Island. Damage to cedar stands was mapped on Cockburn Island and as far east as Thomas Point on Manitoulin Island. The most severe mining occurred on trees in the Walkhouse Point area of Robinson Township, Espanola District.

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.

After declining for two consecutive years, infestations of this pest of white birch *(Betula papyrifera* Marsh.) completely collapsed in the Region in 1985.

The area that had remained infested in 1984 was in the southern and eastern portions of Temagami District and in the central portion of the North Bay District, where moderate-to-severe defoliation was mapped over an area of approximately 419,192 ha. However, in 1985 only a few larvae could be found in white birch stands in the Temagami District and defoliation was not recorded in areas where damage occurred in 1984.

It is expected that this insect's population will remain endemic for several years.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)

Varying population levels of the large aspen tortrix over the past several years have led to fluctuating infestations but, for the

most part, the infestations have remained in the Espanola District. In 1985, however, this insect caused moderate-to-severe defoliation of trembling aspen (*Populus tremuloides* Michx.) trees in the Sault Ste. Marie District and light-to-moderate defoliation in the Espanola District.

In Sault Ste. Marie District, aerial surveys revealed that pockets of moderate-to-severe damage were caused by this insect feeding in the southern part of St. Joseph Island, in Jocelyn and Hilton townships, over approximately 1,500 ha. Ground observations revealed that defoliation varied greatly, and 100% of the foliage was damaged only on small numbers of trees.

In Espanola District, defoliation was generally considered to be lighter and was confined to the highway corridor in parts of Baldwin, Shakespeare, Hallam and Merritt townships, where it totalled approximately 1,350 ha.

Low numbers of the large aspen tortrix were found on Manitoulin Island in infestations of the Bruce spanworm, *Operophtera bruceata* (Hlst.), and near Webbwood in conjunction with an aspen leafroller (*Pseudexentera oregonana* Wlshm.).

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Results of damage surveys, population sampling and egg-mass counts of the spruce budworm will be published with those of other regions at a later date in a report devoted specifically to this insect. The report will provide a complete description and analysis of developments in the spruce budworm situation in Ontario in 1985 and will give infestation forecasts for the province for 1986.

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

In 1985, infestations of the jack pine budworm coalesced in the Northeastern Region following an outbreak in 1984 and initial increases in 1983 from endemic populations. In all, 887,056 ha of jack pine (*Pinus banksiana* Lamb.) forests were moderately to severely defoliated in the Sault Ste. Marie, Blind River, Espanola, Sudbury, Temagami and North Bay districts, in comparison with approximately 429,220 ha in 1984 and 29,970 ha in 1983 (Fig. 1).

The main body of the infestation occupied large areas in the Blind River, Espanola and Sudbury districts, with extensions into the Sault Ste. Marie and Temagami districts and into the Chapleau and Gogama districts of the Northern Region. Small pockets of defoliation lie to the south of the main body in Blind River District, in the vicinity of

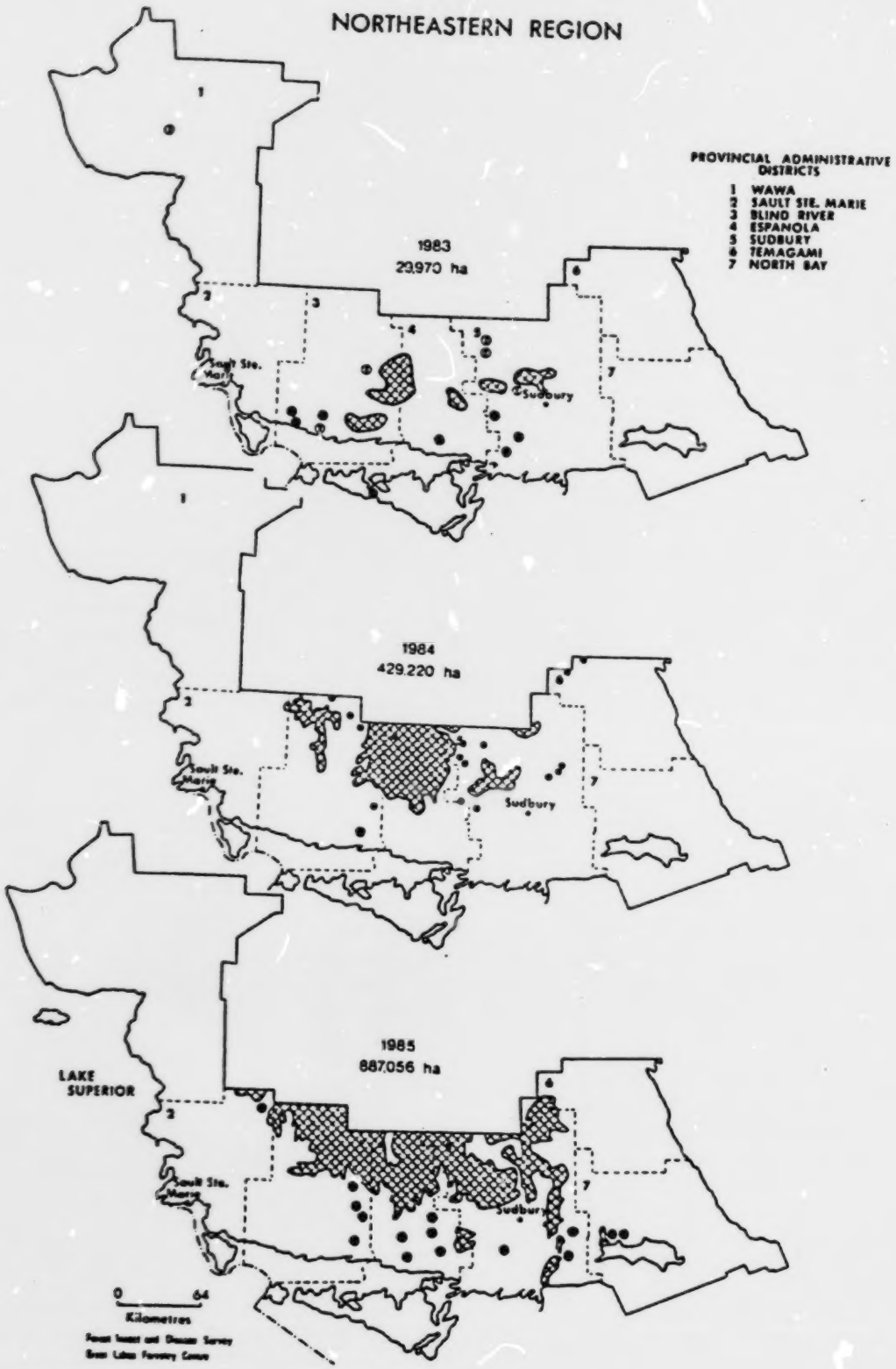


Figure 1. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas within which defoliation of jack pine (*Pinus banksiana* Lamb.) occurred, 1983 to 1985

Moderate-to-severe . . . . . ● or

Light . . . . . ①

Elliot Lake, and in Espanola District near and in the town of Espanola. In Sudbury District the infestation grew substantially and moderate-to-severe defoliation was mapped aerially east of Wanapitae Lake in a band southward to the French River. As well, small pockets were observed on hilltops in the southwest corner of North Bay District and small areas in Temagami District suffered noticeable defoliation (Fig. 2).

Defoliation by this insect was extremely variable in 1985. In some areas pure stands of jack pine were severely defoliated, and the trees were a uniform brick red color in July, whereas in other stands, only occasional trees were lightly defoliated.

This year, a more intensive study was initiated for whole-tree and top mortality associated with jack pine budworm. In areas where moderate-to-severe defoliation has occurred for two or more years, jack pine trees are in poor condition. Surveys west of Richie Falls, Monestime Township, Espanola District, revealed 33% to 41% top mortality and an additional 4% to 7% whole-tree mortality (see Frontispiece). Less severe damage was recorded elsewhere, but mortality and top killing will probably increase as the full impact of defoliation becomes apparent. A total of 15 semipermanent mortality plots were established across the Region to measure the impact of the jack pine budworm, and quantitative results are given in Table 1.

Egg surveys were made in 102 locations in 1985, in infested and adjacent areas throughout the Northeastern Region, to provide information on overwintering populations and to assess the potential for damage in 1986 (Table 2). On the basis of these counts, Blind River, Espanola and Sudbury districts will probably sustain significant moderate-to-severe defoliation in 1986, although the total areas infested may be reduced and the general intensity of the infestation will probably be lower. Forest stands where budworm populations are most likely to be low in 1986 are in those areas with infestation histories of two or more years, in younger stands and, of course, in areas with low egg-mass counts.

Control operations against the jack pine budworm began in 1985 in the Northeastern Region. Over 142,000 ha of infested forests were treated with biological insecticide, either Dipel 132 or Thuricide 48LV, which are different formulations of *Bacillus thuringiensis (B.t.)*. Approximately 54,000 ha were treated in the Blind River District, 77,000 ha in the Espanola District, and 11,000 ha in the Sudbury District. Most of the spray was applied at the 20 BIU/1.6 L/ha rate; however, a few blocks in the Sudbury District were sprayed at an application rate of 20 BIU/3.2 L/ha. Spraying began on 21 June and was completed on 28 June in the Northeastern Region. Preliminary results indicate that population reductions averaged 80% over the entire sprayed area.

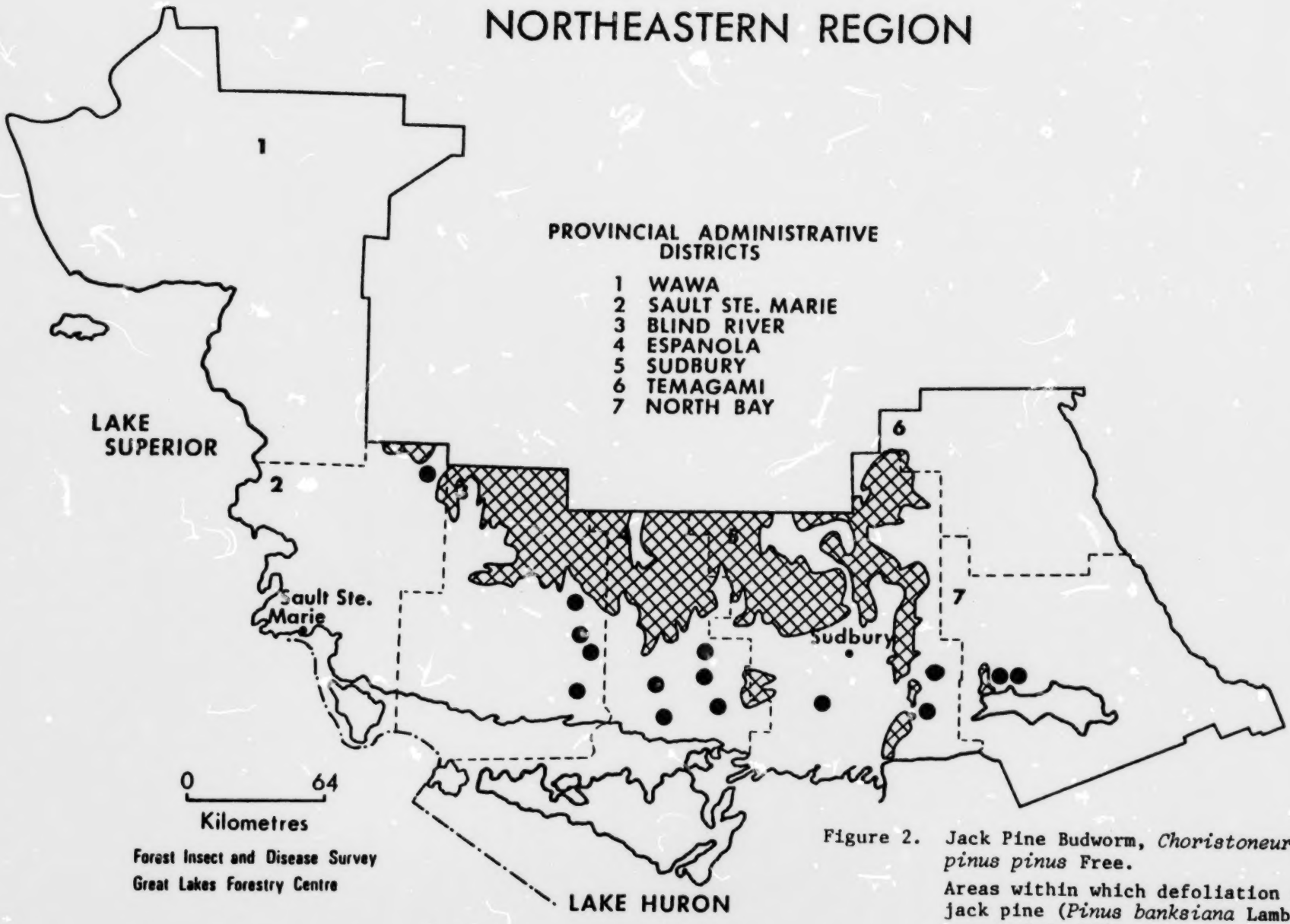


Figure 2. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas within which defoliation of jack pine (*Pinus banksiana* Lamb.) occurred in 1985

Moderate-to-severe . . ● or ▨

Whole-tree and top mortality figures are given in Table 1. Defoliation, egg-mass counts and infestation forecasts are given in Table 2. A special report devoted specifically to this pest will be published at a later date and will provide information on budworm population densities, reductions, more details of the spray program, assessment and forecasts for the province.

Table 1. Summary of 1985 whole-tree and top mortality associated with jack pine budworm in the Northeastern Region (counts based on the examination of 100 jack pine trees at each location).

Location (Twp)	DBH (cm)	Whole-tree mortality (%)	Top mortality (%)
Blind River District			
Gaunt	10	0	0
Lane	13	0	0
Sagard	10	0	0
Winkler	15	0	0
Yaremko	10	0	0
Espanola District			
Gervais[a]	22	6	22
Monestime, Area 1[a]	22	7	41
Monestime, Area 2[a]	13	4	33
Olinyk[a]	24	5	22
Sudbury District			
Cartier	19	0	0
Cascaden	15	0	0
Cox	17	0	3
Hart	17	0	0
Levack	21	0	0
Ulster	17	2	2

[a] aerially sprayed with *B.t.* in 1985

Table 2. Summary of jack pine budworm defoliation and egg-mass counts in 1984 and 1985 and infestation forecasts for 1986 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1986
	1984 (%)	1985 (%)	1984	1985	
Blind River District					
Bouck	58	5	2	2	light
Esten	2	0	1	0	nil
Fabbro[a]	8	8	7	2	light
Gaunt	0	87	0	10	heavy
Kirkwood, Area 1	0	0	0	0	nil
Kirkwood, Area 2	0	0	1	0	nil
Lane[a]	-	23	-	5	medium
Martel, Area 1	14	10	2	2	light
Martel, Area 2	-	0	-	0	nil
Nicholas	0	0	0	0	nil
Nouvel	-	0	-	0	nil
Nuttall	1	86	4	25	heavy
Renwick	-	0	-	0	nil
Rose	1	0	5	0	nil
Sagard	16	76	13	6	heavy
Timbrell	-	0	-	0	nil
Vance[a]	-	5	-	8	heavy
Villeneuve	-	0	-	0	nil
Wardle	0	2	0	1	light
Winkler	33	48	8	0	nil
Yaremko[a]	-	68	-	19	heavy
Espanola District					
Acheson[a]	54	3	18	2	light
Alton	15	55	5	3	medium
Avis[a]	30	4	13	0	nil
Comox[a]	3	51	8	4	medium
Craig[a]	2	5	3	4	medium
Dennie	34	58	4	8	heavy
Dunlop	0	1	0	0	nil
Durban[a]	41	5	8	0	nil
Fontaine	56	50	10	5	medium
Foucault[a]	72	52	14	2	light

(cont'd)

Table 2. Summary of jack pine budworm defoliation and egg-mass counts in 1984 and 1985 and infestation forecasts for 1986 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location) (cont'd).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1986
	1984 (%)	1985 (%)	1984	1985	
Espanola District (cont'd)					
Gerow	1	0	0	0	nil
Gervais[a]	52	6	16	0	nil
Gilbert	2	16	3	4	medium
Hotte[a]	27	19	1	2	light
Hyman	0	1	0	0	nil
Lefebvre[a]	82	9	31	3	medium
Mandamin	59	73	17	12	heavy
Merritt, Area 1	-	64	-	5	medium
Merritt, Area 2	-	69	-	2	light
Monestime[a]	57	18	22	7	heavy
Moses[a]	4	91	9	2	light
Nairn	4	52	0	1	light
Olinyk	93	4	35	7	heavy
Oshell[a]	51	63	11	0	nil
Plourde	1	3	6	0	nil
Poncet[a]	18	4	11	0	nil
Prescott	46	13	19	1	light
Redden[a]	80	8	18	2	light
Rowat[a]	4	8	14	4	medium
Strain	20	77	4	0	nil
Teasdale[a]	62	84	10	3	medium
Tennyson	0	0	0	1	light
Weeks	2	8	1	4	medium
North Bay District					
Falconer	-	1	-	0	nil
Hobbs	-	1	-	0	nil
Janes	-	0	-	0	nil
Kirkpatrick	-	0	-	0	nil
Macpherson	-	2	-	2	light
McNish	-	24	-	2	light
McWilliams	-	1	-	0	nil
Springer	-	23	-	3	medium

(cont'd)

Table 2. Summary of jack pine budworm defoliation and egg-mass counts in 1984 and 1985 and infestation forecasts for 1986 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location) (cont'd).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1986
	1984 (%)	1985 (%)	1984	1985	
Sault Ste. Marie District					
Parke	-	1	-	1	light
Sudbury District					
Acadia	-	0	-	2	light
Antrim[a]	-	24	-	3	medium
Awrey	-	0	-	0	nil
Aylmer[a]	62	91	12	1	light
Beresford[a]	58	14	9	1	light
Bowell	76	56	9	12	heavy
Capreol	-	15	-	6	heavy
Cartier, Area 1	61	6	4	1	light
Cartier, Area 2	82	23	11	3	medium
Cascaden, Area 1	82	87	23	2	light
Cascaden, Area 2	57	18	7	1	light
Cox	-	100	-	1	light
Delamere	-	96	-	8	heavy
Ermatinger, Area 1	4	13	9	1	light
Ermatinger, Area 2	32	9	16	1	light
Fay[a]	19	43	9	3	medium
Haddo	-	22	-	3	medium
Hart	38	34	8	7	heavy
LaFleche	15	19	1	2	light
Leinster[a]	43	24	28	14	heavy
Levack	14	26	2	1	light
Lorne	-	44	-	0	nil
Louise	-	48	-	17	heavy
Lumsden	2	22	7	0	nil
Munster	28	41	8	3	medium
Rhodes	5	34	13	4	medium
Scadding	-	24	-	7	heavy
Ulster	47	86	5	5	medium

(cont'd)

Table 2. Summary of jack pine budworm defoliation and egg-mass counts in 1984 and 1985 and infestation forecasts for 1986 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location) (concl.).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1986
	1984 (%)	1985 (%)	1984	1985	
Temagami District					
Aston	–	0	0	0	nil
Gamble	–	11	0	0	nil
Gillies Limit, Area 1	12	3	1	0	nil
Gillies Limit, Area 2	37	2	0	0	nil
Strathy	48	0	1	0	nil
Wawa District					
Alanen	–	0	–	0	nil
Ashley	–	0	–	0	nil
Charbonneau	–	0	–	0	nil
Magone	–	0	–	0	nil
Memaskwosh	–	0	–	0	nil
Mikano	–	0	–	2	light

[a] aerially sprayed with *B.t.* in 1985

Jack Pine Tip Beetle, *Conophthorus banksianae* McPherson

Surveys in 1985 for this damaging pest of pine revealed a low degree of leader mortality at several points in the Region. Sampling in four jack pine plantations in Wawa, Blind River and Sudbury districts revealed leader damage ranging from 0.6% to 2.6%. This is slightly less than the highest count in 1984 when 5.3% of the leaders were damaged in a jack pine plantation in Wawa District. Elsewhere in the Region only a trace of damage was observed at widely scattered locations.

Oak Leaf Shredder, *Croesia semipurpurana* (Kft.)

Populations of this serious pest of red oak (*Quercus rubra* L.) declined markedly in the Sault Ste. Marie and Blind River districts in 1985. Defoliation surveys this year revealed that damage was approximately 75% lower than that recorded in 1984 (Table 3).

Experimental pheromone trapping at four locations was continued in 1985 as a part of a continuing survey to evaluate the potential of pheromones as a tool in forecasting future infestations. At present, however, results are inconclusive.

Egg surveys indicate that infestations will continue at very light levels in Thessalon and Long townships, Blind River District, and Tarentorus Township, Sault Ste. Marie District, and will probably collapse in Hilton Township, Sault Ste. Marie District, in 1986.

Table 3. Summary of damage by the oak leaf shredder on red oak trees in the Northeastern Region from 1983 to 1985, and forecasts for 1986 (defoliation counts based on the examination of the foliage on 10- to 35-cm branch tips selected randomly from five trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Defoliation (%)			Forecast[a] for 1986
				1983	1984	1985	
Sault Ste. Marie District							
Hilton	40	500	25	32.3	4.0	3.0	nil
Tarentorus	25	500	20	17.5	22.5	5.5	light
Blind River District							
Thessalon	00	300	25	14.3	41.0	11.0	light
Long	25	200	15	5.6	4.0	1.0	light

[a] Forecast based on the numbers of eggs counted on two 35-cm branch tips from the mid-crown of four red oak trees at each location.

Greenstriped Mapleworm, *Dryocampa rubicunda rubicunda* (Fabr.)

Populations of this mapleworm collapsed completely in 1985 after declining considerably in 1984 in the Northeastern Region. Heavy infestations which have persisted for three consecutive years in Selby Township, Temagami District, subsided in 1985. No defoliation was observed in aerial surveys or ground checks in the area.

Eastern Pine Shoot Borer, *Eucosma gloriola* Heinr.

The incidence of this pest of plantation jack pines has remained consistently low for several years. Population levels declined appreciably in Barr Township, Temagami District, where serious leader damage occurred in 1983 and 1984. Elsewhere, quantitative results show that leader damage ranged from 1% to 5% (Table 4). This pest also attacks lateral shoots; however, such damage is not considered as serious as leader damage, because the form of the tree is not affected.

Table 4. Summary of damage by the eastern pine shoot borer in the Northeastern Region from 1983 to 1985 (counts based on the examination of 150 or 300 jack pine trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%)		
				1983	1984	1985
Sault Ste. Marie District						
Hurlburt[a]	50	5,000	2.2	0	1	1
Blind River District						
Villeneuve[a]	20	3,000	2.0	-	-	0
Haughton	50	3,000	3.0	-	-	1
Haughton	50	3,000	3.0	-	-	1
Espanola District						
Rowat	100	4,000	1.7	-	-	2
Sudbury District						
Hendrie[a]	50	3,000	3.5	-	-	1
Temagami District						
Barr	50	3,000	2.0	13	10	5

[a] 300-tree sample

Birch Leafminer, *Fenusa pusilla* (Lep.)

Populations of this leafminer were more widely distributed in 1985 than in previous years in the Northeastern Region. Surveys revealed moderate-to-severe damage on roadside and shade trees at scattered points in Fenwick Township and at Pancake Bay Provincial Park, Sault Ste. Marie District, throughout approximately 200 ha in cutovers and roadside regeneration trees in Huotari Township, Wawa District, and in McKim Twp, Sudbury District. Heavy mining continued to cause discoloration of white birch ornamentals and mature trees within the towns of Espanola and North Bay and scattered trees were reinfested in approximately 25 ha of forested land in the Latchford, Gillies and Colbalt areas, Temagami District.

Light leafmining was commonly observed at several points elsewhere in the Region.

Gyspy Moth, *Lymantria dispar* (L.)

In a continuing effort to detect and monitor the spread of gypsy moth, pheromone traps were again deployed in 1985 in specific locations across the Northeastern Region (Fig. 3).

These pheromone traps, containing a sex attractant, lure male moths in the immediate area into the trap (see photo page). Once there, they are caught by a sticky substance that lines the inside of the trap. In 1985, 56 traps were deployed in the Region, two traps at each of 18 locations and 10 traps at two locations where positive captures were obtained in 1984. Negative results were returned from 15 locations, one male moth was caught at three other locations, two moths were caught at Mississagi Provincial Park, and three moths were captured at Red Lodge, Bidwell Township on Manitoulin Island where, in 1984, one moth was captured (Table 5).

These captures do not necessarily indicate the presence of an established gypsy moth population. For confirmation of an established population in an area another stage of the life cycle must be collected. They do, however, indicate the possibility of an infestation and enable more intensive surveys to focus on specific suspect areas. Further survey work will be carried out at Red Lodge, Bidwell Township, Espanola District, in 1986 to determine the presence or absence of a larval population.

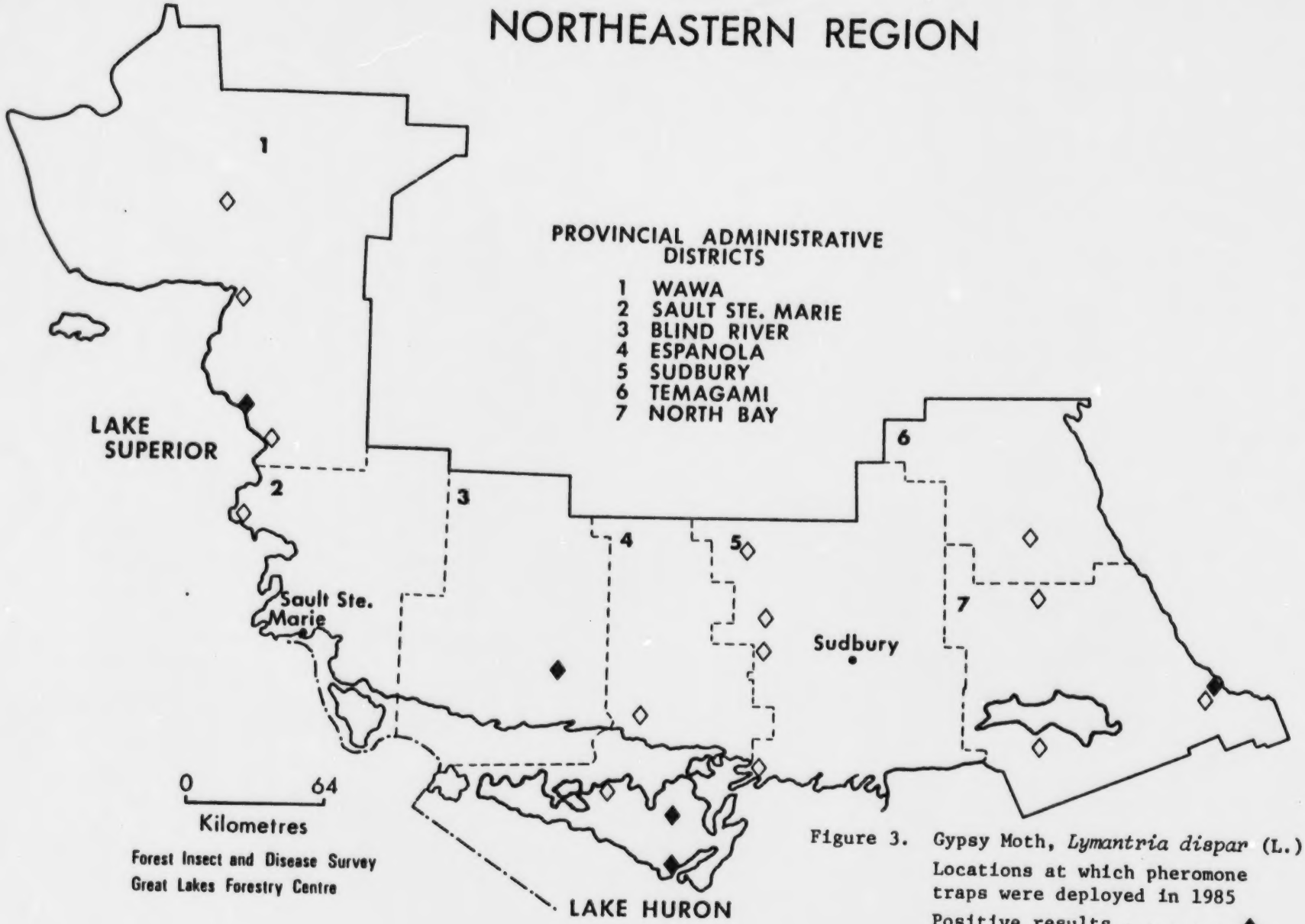


Figure 3. Gypsy Moth, *Lymantria dispar* (L.)
Locations at which pheromone traps were deployed in 1985
Positive results . . . . . ◆
Negative results . . . . . ◇

Table 5. Gypsy moth pheromone trap locations, number of captures, and year in which male moths were captured in the Northeastern Region (two traps deployed at each location except where otherwise indicated).

Location	No. of male moths captured	Year in which male moths were captured
Wawa District		
White Lake Provincial Park	1	1982
Obatanga Provincial Park	1	1981
Rabbit Blanket Lake Campground	1	1980
Agawa Bay Campground	1	1985
Crescent Lake Campground	-	-
Sault Ste. Marie District		
Pancake Bay Provincial Park	-	-
Blind River District		
Mississagi Provincial Park	2	1985
Espanola District		
Chutes Provincial Park	-	-
Gore Bay, Gordons Lodge	-	-
Bidwell, Red Lodge[a]	1, 3	1984, 1985
South Baymouth Trailer Park	1	1985
Sudbury District		
Halfway Lake Provincial Park	-	-
Windy Lake Provincial Park	1	1981
Fairbanks Provincial Park[a]	1	1984
Killarney Provincial Park	-	-
North Bay District		
Antoine Provincial Park	1	1985
Marten River Provincial Park	-	-
Restoule Provincial Park	-	-
Samuel de Champlain Provincial Park	1	1983
Temagami District		
Finlayson Point Provincial Park	-	-

[a] ten traps deployed at these locations

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Infestations of this defoliator of trembling aspen increased markedly in the Northeastern Region in 1985. The total area of moderate-to-severe defoliation increased from 51,360 ha in 1984 to 108,270 ha in 1985.

The large infestation, which occurred in the northeastern corner of Temagami District in 1984, almost doubled in 1985 to total 94,970 ha. The affected area extended from Harris, Dymond, Hudson and Lundy townships in the north to the mouth of the Montreal River on Lake Timiskaming, in all or part of 11 townships. The infestation extended into the Kirkland Lake District in the Northern Region and east into Quebec (Fig. 4).

A new area of some 13,000 ha of moderate defoliation of trembling aspen was detected by aerial surveys in Nebotik and Conking townships, Wawa District. This infestation, however, was inaccessible, and therefore could not be confirmed by ground checks. The infestation in the Elliot Lake-Depot Lake area of Blind River District declined, encompassing only 300 ha of forested land this year.

Large moth flights were observed during the latter part of July as far south as Temagami and some moths were collected in Mattawa, North Bay District. Egg-band counts were taken at four locations to forecast populations for 1986 and these counts indicate that severe defoliation will recur in all areas sampled (Table 6).

Early Birch Leaf Edgeminer, *Messa nana* (Klug)

This leafminer, of European origin, was first found in Ontario in 1967 on the north shore of Lake Ontario. Since then it has spread throughout southern Ontario, and some localized severe infestations have been reported. The insect had not been identified in northern Ontario by the Forest Insect and Disease Survey Unit (FIDS), until the summer of 1985, when low numbers were found on open-grown white birch (see photo page) in conjunction with other birch leafminers, *Fenusa pusilla* Lep. and *Profenusa thomsoni* (Konow) in the city of Sudbury and vicinity. Previously, it had been found some 300 km to the southeast in the Algonquin Park District of southern Ontario.

Adults of this insect emerge from early May to mid-June. Eggs are laid singly on leaves, where they cause brownish blisters on the upper surface near the edge. The larvae feed, mining the leaf, until late June and July when they drop to the ground and spin a soil-encrusted cocoon in the topsoil. They overwinter in the topsoil and change to pupae in the spring. Further surveys will continue in 1986 to determine increases in distribution.

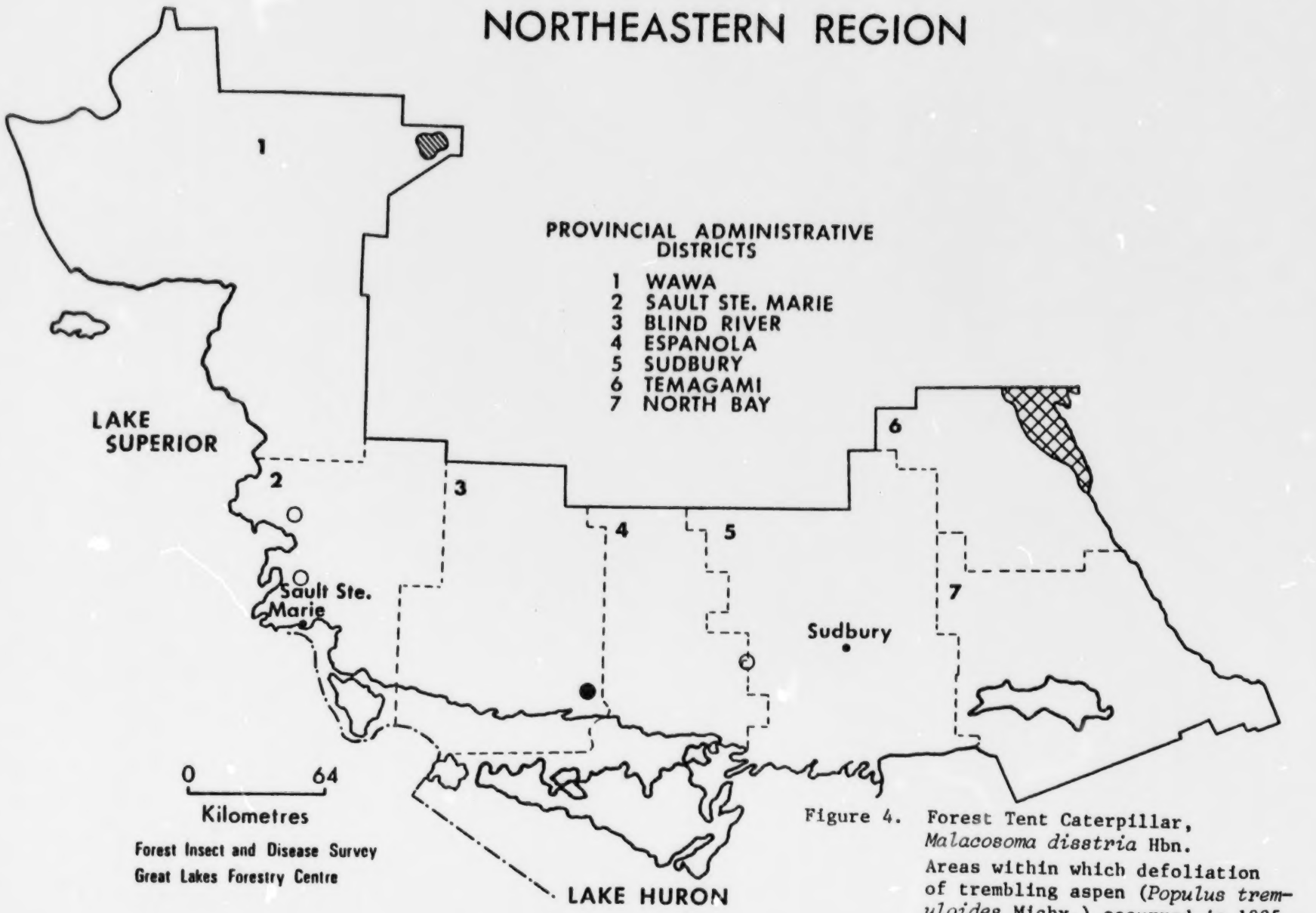


Figure 4. Forest Tent Caterpillar, *Malacosoma disstria* Hbn. Areas within which defoliation of trembling aspen (*Populus tremuloides* Michx.) occurred in 1985
Moderate-to-severe . . ● or
Light-to-moderate . . . O or

Table 6. Summary of forest tent caterpillar egg-band counts in 1985 and infestation forecasts for 1986 in the Northeastern Region (counts based on the examination of one or three trembling aspen trees at each location).

Location (Twp)	Avg DBH of sample trees/cm	No. of trees examined	Avg no. of egg bands per tree	Infestation forecasts for 1986
Blind River District				
Proctor	10	3	12	heavy
Temagami District				
Gillies Limit	7	1	19	heavy
South Lorrain	7	1	75	heavy
Hudson	5	1	57	heavy

Swaine Jack Pine Sawfly, *Neodiprion swainei* Midd.

The Swaine jack pine sawfly infestation in the Elk Lake Management Unit remained at trace levels for the second consecutive year. This infestation peaked in 1981, causing moderate-to-severe defoliation of jack pine throughout 5,700 ha of forested land. It has since declined steadily, reaching its present level in 1984. Small numbers of larvae were found on scattered jack pine at several points on Rabbit, Lady Evelyn and Temagami lakes in 1985. The only exception was on Island No. 127 of Temagami Lake where jack pine has sustained 80% cumulative defoliation in a 1-ha area over the past several years.

Bruce Spanworm, *Operophtera bruceata* (Hlst.)

Populations of this periodic defoliator of deciduous trees increased for the second consecutive year in the Northeastern Region. Trembling aspen, sugar maple (*Acer saccharum* Marsh.), and red oak were moderately to severely defoliated throughout a total area of 28,000 ha, in comparison with 5,826 ha in 1984.

By far the largest infestation, some 22,000 ha, occurred on the north half of St. Joseph Island and on Campement d'Ours Island in the Sault Ste. Marie District (Fig. 5). In this area moderate-to-severe defoliation was generally more prevalent on understory and regeneration trees. Damage was also detected in some 35 pockets on Manitoulin and Cockburn islands, Espanola District, where the insect fed in conjunction

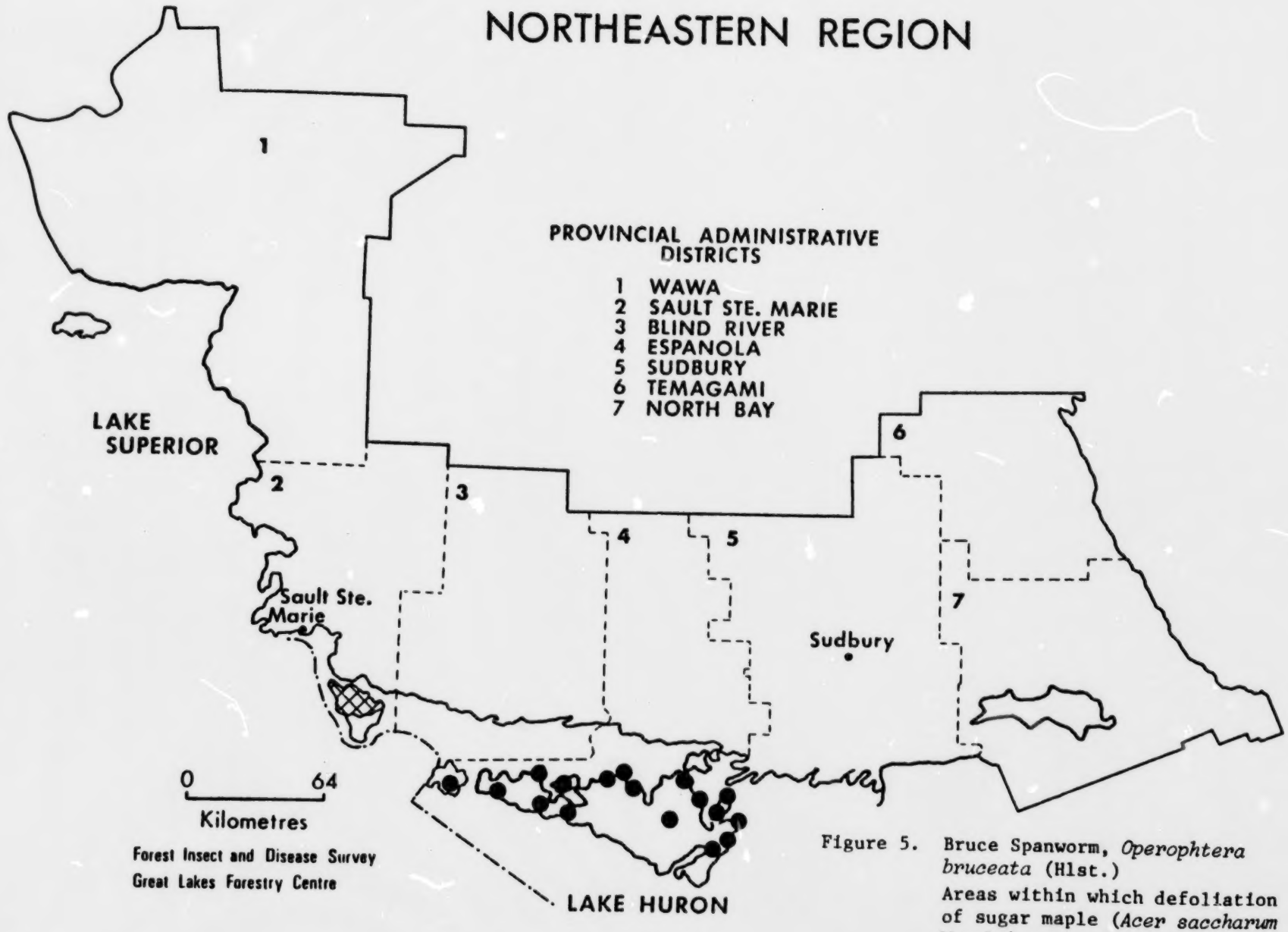


Figure 5. Bruce Spanworm, *Operophtera bruceata* (Hlst.)
Areas within which defoliation of sugar maple (*Acer saccharum* Marsh.) occurred in 1985
Moderate-to-severe . . ● or ▨

with the large aspen tortrix in several trembling aspen stands. The pockets of infestation ranged from 50 ha to 200 ha, with defoliation as high as 80%.

Records indicate that infestations usually collapse after two or three years' duration. A ground beetle predator of the Bruce spanworm, *Calosoma frigidum* Kby., was found commonly on St. Joseph Island, Sault Ste. Marie District.

White Pine Weevil, *Pissodes strobi* (Peck)

Damage by this perennial pest has been on the decline in most areas that can be compared for the past two years in the Northeastern Region.

A low incidence of damage on jack pine was recorded in all areas examined except in a 50-ha plantation of 2-m-high trees in Barr Township, Temagami District, where 13% of the trees were infested (Table 7). The Ontario Ministry of Natural Resources (OMNR) carried out a clipping and burning program in Lumsden Township, Sudbury District, which reduced leader damage from 20% in 1984 to 2% in 1985.

Clipping of infested stems before the insect emerges in July and August is a proven control method used by OMNR. However, the infested stems must be removed and destroyed to remove the risk of reinfestation.

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)

A marked decline in populations of this defoliator of mountain-ash (*Sorbus* spp.) trees was evident throughout most of the Northeastern Region in 1985.

In Wawa District this sawfly was commonly found on host trees, which suffered 25% to 40% defoliation. The most severe damage occurred in Obatanga Provincial Park where trees within the campground sustained 60% defoliation. In the northwestern and western parts of Sault Ste. Marie District most host trees observed had only trace damage; however, occasional trees were severely defoliated.

Populations collapsed in the remainder of the Region, i.e., in the Blind River, Espanola, Sudbury, Temagami and North Bay districts, and no defoliation was found during regular surveys.

Minor Insects

Maple Trumpet Skeletonizer, *Epinotia aceriella* (Clem.)

A marked decrease in population levels occurred for the second consecutive year in the Northeastern Region.

Surveys revealed light-to-moderate defoliation on sugar maple within approximately 6,000 ha of forested land on St. Joseph Island, Sault Ste. Marie District. Populations in the North Bay and Espanola districts collapsed and no larvae could be found.

Elsewhere, trace damage was observed along roadsides and at scattered points in the southern part of the Sault Ste. Marie District.

Table 7. Summary of damage by the white pine weevil in plantations in the Northeastern Region from 1983 to 1985 (counts based on the examination of 150 or 300 randomly selected pine trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%)		
					1983	1984	1985
Sault Ste. Marie District							
Hurlburt[a]	jP	50	5,000	2.2	-	4	3
Blind River District							
Villeneuve[a]	jP	20	3,000	2.0	1	2	1
Haughton	jP	10	1,500	1.0	-	-	3
Haughton	jP	50	3,000	3.0	5	3	2
Lane	jP	10	3,000	1.5	-	-	5
Patton	wP	10	3,000	2.0	-	-	2
Timbrell	jP	100	3,000	1.5	-	-	1
Viel	jP	50	3,000	2.0	-	-	4
Espanola District							
Nairn[a]	jP	24	5,000	2.8	5	6	2
Merritt	jP	10	3,000	1.3	-	-	5
Sudbury District							
Hendrie[a]	jP	50	1,500	3.5	4	2	1
Lumsden	jP	20	4,500	1.5	-	20	2
Temagami District							
Barr	jP	50	3,000	2.0	-	-	13

[a] 300-tree sample

Table 8. Other forest insects.

Insect	Host(s)	Remarks
Acrobasis betulella Hlst. Birch tubemaker	wB	light defoliation evident in birch stands throughout most of Temagami District and in Burwash and McKim twps, Sudbury District
Altica ambiens alni Harr. Alder flea beetle	Al	heavy defoliation at scattered points in the Temagami District
Altica populi Brown Poplar flea beetle	bPo	Moderate-to-severe defoliation recurred in host stands up to 1.0 ha in size in Curtin, Foster, Hallam, Merritt and Mongowin twps, Espanola District.
Aphrophora cribrata (Wlk.) Pine spittlebug	jP	found commonly along Hwy 17 through Obatanga Prov. Park, Wawa District
Archips cerasivorana (Fitch) Uglynest caterpillar	ecCh	Conspicuous tents were observed in old fields and along roadsides in the Haileybury, New Liskeard and Cobalt area of Temagami District
Arge pectoralis (Leach) Birch sawfly	wB	Increased populations caused up to 100% defoliation of open-grown host trees in a 5-ha area in McKim Twp, Sudbury District
Chrysomela walshi Brown Balsam poplar leaf beetle	bPo	light feeding at many points in the Temagami District
Coleophora comptoniella (McD.) Lesser birch casebearer	wB	trace numbers found on host trees causing light damage in McKim Twp, Sudbury District

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Coleophora laricella (Hbn.) Larch casebearer	tL	moderate-to-severe damage observed in 2-ha stands in Banfield and Carnarvon twps, North Bay and Espanola districts, respectively; low damage sustained by roadside trees on the Garden River Indian Reserve, Sault Ste. Marie District, and in Lewis Twp, Blind River District
Coleophora pruniella Clem. Cherry casebearer	wB	trace damage on white birch trees in McKim Twp, Sudbury District
Conophthorus resinosae Hopk. Red pine cone beetle	rP	Conspicuous damage was observed in Finlayson Point Prov. Park and on the shorelines of Lake Temagami, Temagami District.
Dioryctria reniculelloides Mut. & Mun. Spruce coneworm	bF, wS	Low numbers were collected throughout the Wawa District.
Dioryctria resinosella Mut. Red pine shoot moth	rP	Approximately 30% of the new shoots were affected in a 10-ha plantation in Burwash Twp, Sudbury District.
Epinotia solandriana L. Birch-aspen leafroller	wB	light-to-moderate defoliation of smaller trees at several points in the Temagami District
Erannis tiliaria (Harr.) Linden looper	deciduous	light defoliation observed at scattered points in the Sault Ste. Marie, Blind River and Espanola districts

(cont'd)

Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Eupareophora parca (Cress.) Spiny ash sawfly	bAs	upper third of crowns of host trees lightly defoliated in 1-ha stands examined in the Temagami District
Gonioctena americana (Schaef.) American aspen beetle	tA	In White Lake Prov. Park, Wawa District, young trees suffered 60% to 100% defoliation. Elsewhere, trace damage was observed on immature roadside host trees in Proctor and Calvin twps, Blind River and North Bay districts, respectively.
Hyphantria cunea (Dru.) Fall webworm	deciduous	Various host trees were 100% defoliated along roadsides in Beaucage Twp, North Bay District. Light damage was observed at scattered points in Blind River, Espanola, Sudbury and Temagami districts.
Malacosoma americanum F. Eastern tent caterpillar	ecCh	High populations often caused 100% defoliation of roadside and field shrubs in Sudbury, Espanola and North Bay districts; two colonies were observed in Proctor Twp, Blind River District.
Malacosoma californicum pluviale Dyar Northern tent caterpillar	ecCh	trace populations collected in Timbrell Twp, Blind River District
Micurapteryx salicifoliella Cham. Willow leafminer	W	High populations caused severe browning of willow foliage in the White River area, Wawa District.

(cont'd)

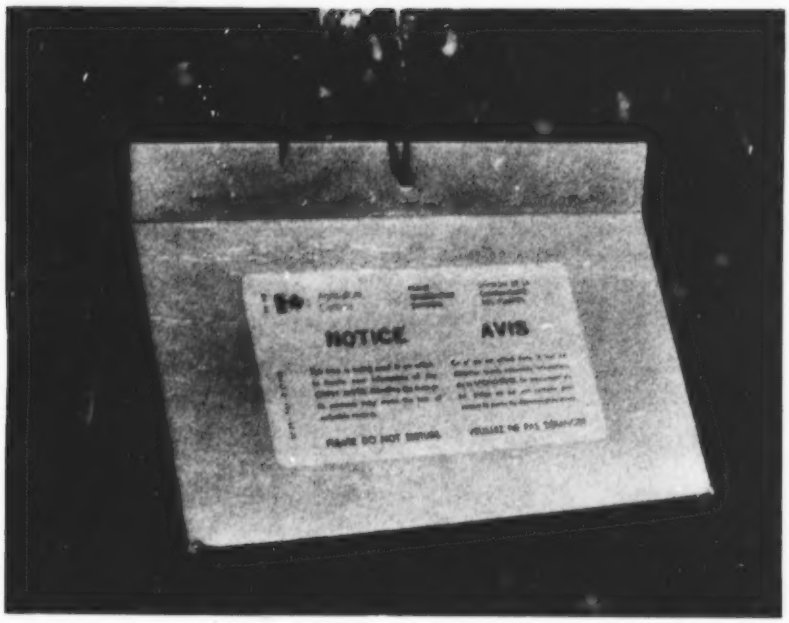
Table 8. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Neodiprion lecontei (Fitch) Redheaded pine sawfly	rP	Trace numbers were collected in a 5-ha plantation in Campbell Twp and on scattered trees in Widdifield Twp in Espanola and North Bay districts, respectively.
Neodiprion nanulus nanulus Schedl. Red pine sawfly	rP, jP	Defoliation of less than 10% occurred in McKim and Hunt twps, Sudbury and Wawa districts, respectively, and moderate damage was observed on smaller trees at several points on islands and along shorelines of Lake Temagami, Temagami District.
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	Trace numbers were collected from the crowns of mature trees throughout Ulster Twp, Sudbury District.
Neodiprion sertifer (Geoff.) European pine sawfly	jP, scP	Low numbers were collected on jack pine in Fisher Twp, Sault Ste. Marie District. This represents a northerly extension of the known distribution. Elsewhere, populations recurred, causing 10% to 20% defoliation of some Scots pine (*Pinus sylvestris* L.) in Billings Twp, Espanola District.
Nymphalis antiopa (L.) Mourningcloak butterfly	W	Small numbers of insects causing 10%-25% defoliation were collected in Bailloquet and McKim twps, Wawa and Sudbury districts, respectively.

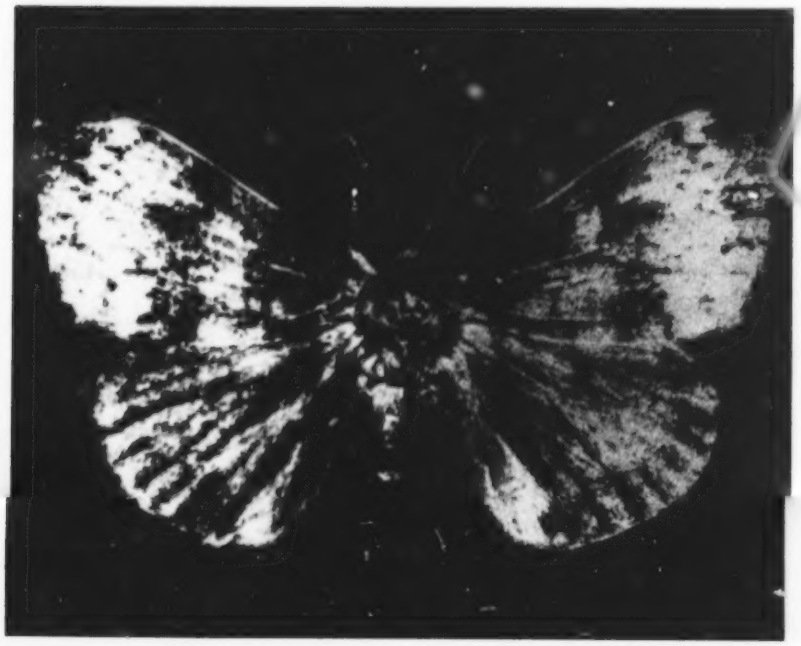
(cont'd)

Table 8. Other forest insects (concl.).

Insect	Host(s)	Remarks
Phyllonorycter ontario (Free.) Aspen leafblotch miner	tA	This insect caused up to 100% browning of leaves on immature trees in the White River area, Wawa District.
Pikonema alaskensis (Roh.) Yellowheaded spruce sawfly	wS, bS	Ornamental and roadside trees under 2 m suffered from 10% to 100% defoliation at many locations in Espanola, Sudbury, Sault Ste. Marie, Blind River and Temagami districts.
Pristiphora erichsonii (Htg.) Larch sawfly	tL	Light defoliation was recorded on host trees in Campbell Twp, Espanola District, and Winkler Twp, Blind River District.
Pseudexentera oregonana Wlshm. Aspen leafroller	tA	light defoliation observed at several locations along roadsides in the Wawa and Temagami districts
Pulicalvaria thujaella (Kft.) Brown cedar leafminer	eC	Low populations causing 2% defoliation were recorded in hedgerows of cedar in Windy Lake Prov. Park, Dowling Twp, Sudbury District.
Zelleria haimbachi Busck Pine needle sheathminer	jP	High numbers recurred in host stands up to 10 ha in size throughout the northern part of the Temagami District. Also, 2% to 10% of the new shoots were affected on semimature trees in Sagard and Bouck twps, Blind River District, and in Papineau Twp, North Bay District.



Pheromone trap (above), baited with a sex attractant to lure the adult male gypsy moth, *Lymantria dispar* (L.) (below), is used in an effort to detect and monitor spread of the gypsy moth population.



Mine of the early birch leaf edgeminer, *Messa nana* (Klug), on white birch (*Betula papyrifera* Marsh.). This is the first FIDS record of this insect in northern Ontario.

TREE DISEASES

Major Diseases

Armillaria Root Rot, *Armillaria mellea* (Vahl: Fr.) Kummer

Armillaria root rot is known to attack and kill all species of trees and especially trees previously weakened by other factors such as abiotic conditions. Over the past several decades, the pathogen has been observed commonly at low levels in coniferous and deciduous stands throughout the Region. Surveys in 1985 revealed no significant change in the incidence of damage.

Evaluations conducted in five pine plantations averaging 1.6 m in height at widely separated locations confirmed that damage remained at a low level. Only 1% current mortality was recorded in each plantation (Table 9).

Table 9. Summary of damage caused by Armillaria root rot in five plantations in the Northeastern Region in 1985 (counts based on the examination of 150 or 300 trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Current mortality (%)
Blind River District					
Timbrell	rP	50	2,900	0.5	1
Villeneuve[a]	jP	20	3,000	2.0	1
Espanola District					
Nairn[a]	jP	24	5,000	2.3	1
Sudbury District					
Hendrie[a]	jP	50	3,000	3.5	1
North Bay District					
Mattawan	wP	10	500	1.0	1

[a]300-tree sample

Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

An increase in the distribution of the North American race of this disease was recorded for the second consecutive year (Fig. 6), and a marked increase in the incidence of infection was evident in the Northeastern Region in 1985.

New infection centers were recorded in Recollet and Peever townships in the Wawa District, in two stands in Haughton Township and one stand in Patton Township in the Blind River District.

Evaluations conducted at widely separated locations revealed that in the Wawa District the incidence of infection on roadside jack pine regeneration trees in Esquega Township increased from 4.0% in 1984 to 23.0% in 1985 and that 85% of the jack pine trees in a new infection center in a plantation in Recollet Township were infected. In Hurlburt Township in the Sault Ste. Marie District, where the pathogen was first recorded in 1984, the incidence of infection increased by approximately 100% in 1985. Surveys of damage in an infected red pine (*Pinus resinosa* Ait.) plantation from 1983 to 1985 in Haughton Township in the Blind River District also revealed an increase in the number of infected trees (Table 10). Elsewhere in Blind River District, damage was light in two new infection centers in Haughton Township and in one center in Patton Township.

Surveys in the above-mentioned heavily infected red pine plantations in Haughton Township showed 23.2% current mortality in 1985.

Over the past several years, special surveys have been carried out to determine if the European race of the disease is present in the province. Numerous samples from trees showing symptoms of Scleroderris canker infection have been submitted to the Great Lakes Forestry Centre (GLFC) where serological tests revealed the presence of the pathogen at three locations in the Algonquin Region. Elsewhere, including the Northeastern Region, all of the above tests proved negative.

A sanitation program was carried out in each area in which the pathogen was recorded. Affected trees were removed and destroyed by burning.

Ink Spot of Aspen, *Ciborinia whetzelii* (Seaver) Seaver

Aerial and ground surveys revealed that this pathogen was more widely distributed through the Northeastern Region than in 1984. Pockets of moderate-to-severe foliar damage were observed through approximately 200 ha of trembling aspen stands in Hoffman Township in the Sault Ste. Marie District, at scattered points in Drury Township in the Sudbury District and at numerous points throughout the Temagami District (Fig. 7).

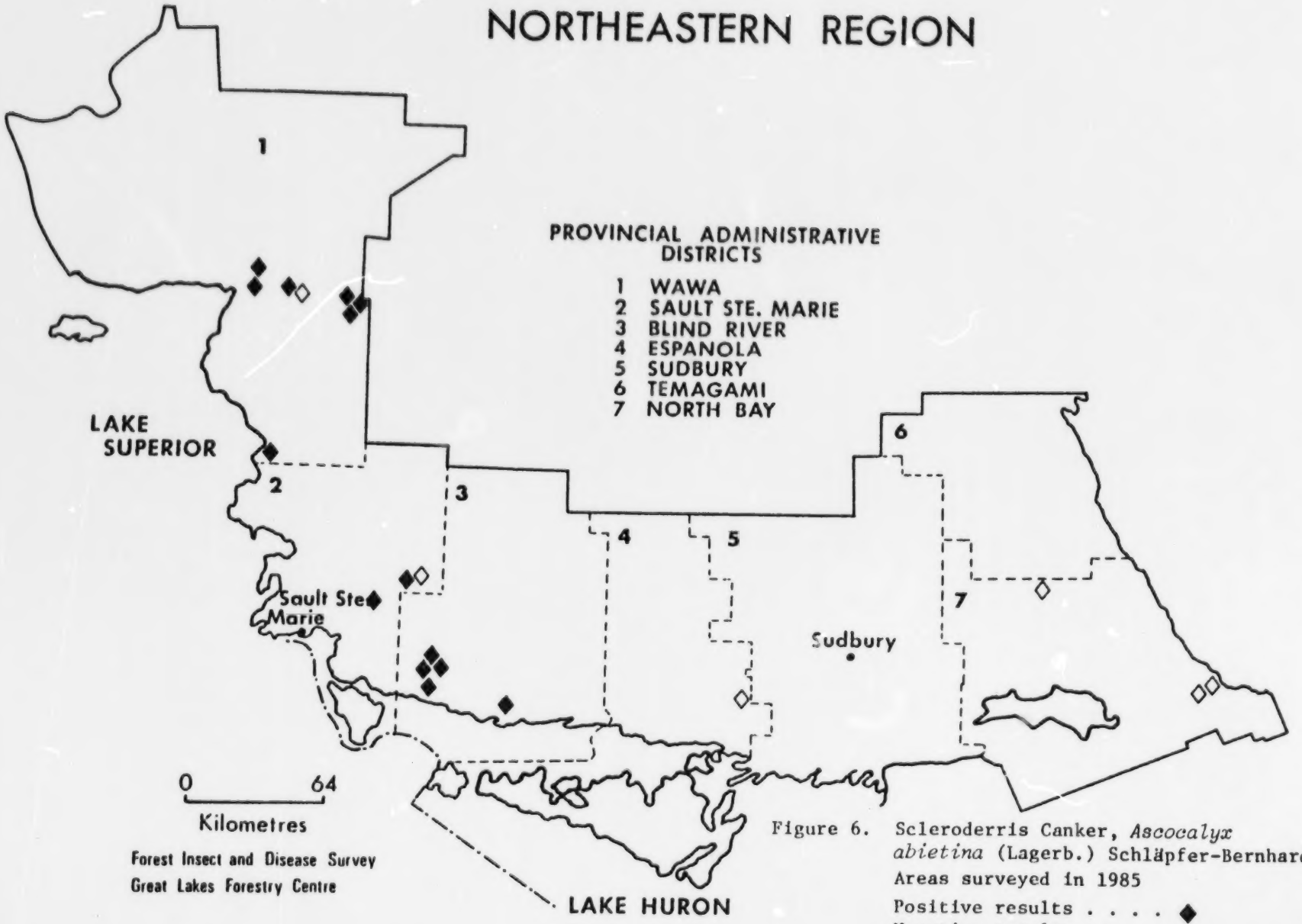


Figure 6. Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard
Areas surveyed in 1985
Positive results . . . . ◆
Negative results . . . . ◇

Table 10. Summary of damage caused by Scleroderris canker in the Northeastern Region from 1983 to 1985 (counts based on the examination of 150 or 300 randomly selected trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)			Tree mortality (%)		
					1983	1984	1985	1983	1984	1985
Wawa District										
Esquega	jP	10	2,500	1.5	-	4.0	23.0	-	0.0	0.0
Recollet	jP	100	3,000	2.5	-	-	85.0	-	-	0.0
Sault Ste. Marie District										
Hurlburt[a]	jP	50	5,000	2.2	-	0.7	1.3	-	0.0	0.3
Blind River District										
Haughton	rP	20	2,500	1.0	47.0	79.3	97.7	23.6	16.8	23.2
Patton	rP	2	3,000	2.0	-	-	4.0	-	-	0.0

[a] 300-tree sample

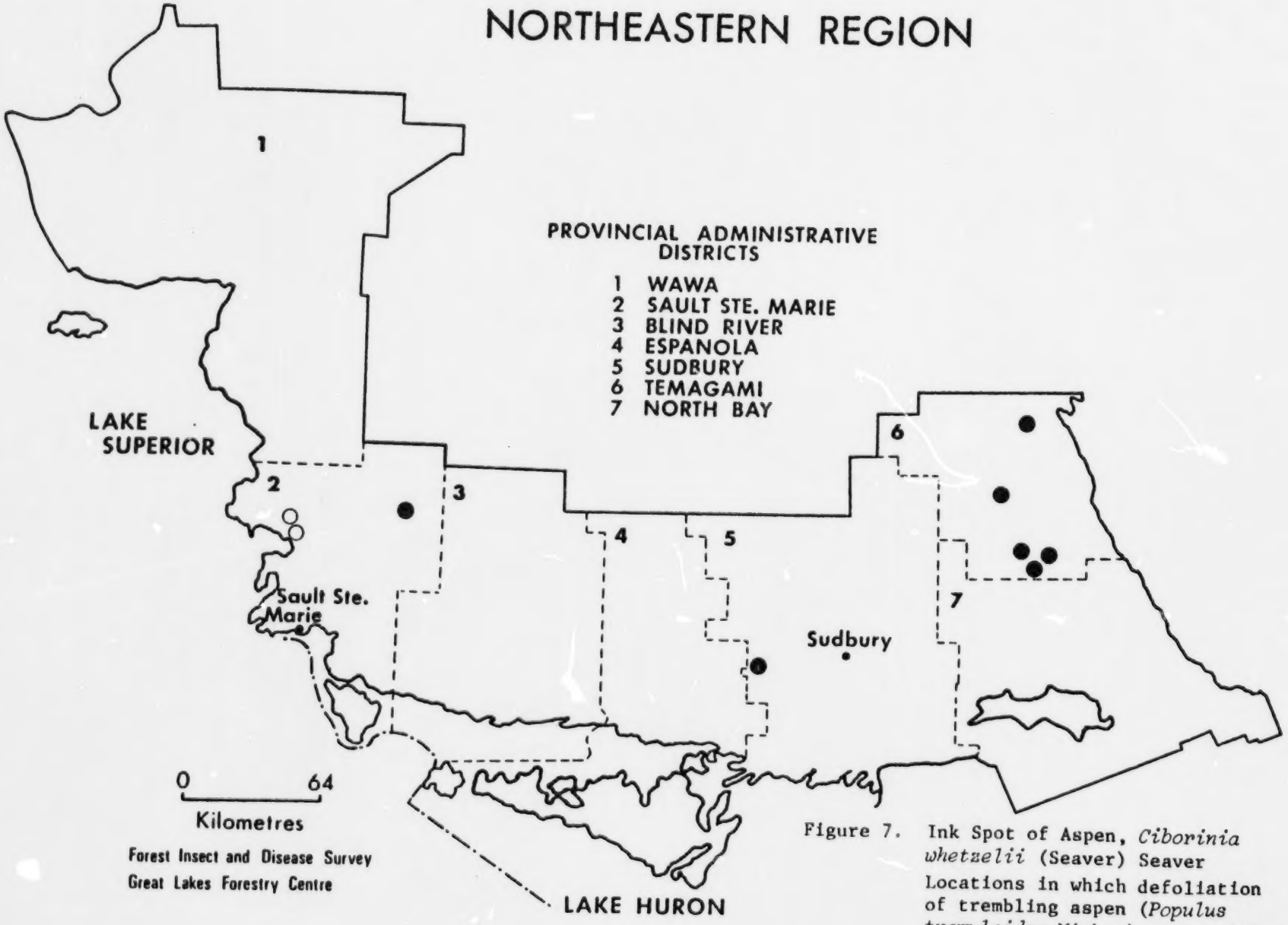


Figure 7. Ink Spot of Aspen, *Ciborinia whetzelii* (Seaver) Seaver
Locations in which defoliation of trembling aspen (*Populus tremuloides* Michx.) occurred in 1985
Moderate-to-severe . . . . . ●
Light . . . . . ○

Light damage was observed along roadsides and on fringes of stands at scattered points in the southern half of the Sault Ste. Marie and Sudbury districts as well.

This pathogen caused foliage mortality by mid- to late June and premature foliage drop, leaving infected trees barren of foliage by late August.

Tar Spot Needle Cast, *Davisomycella ampla* (J. Davis) Darker

General surveys and a special survey in 12 jack pine plantations showed that the incidence of foliar damage caused by this needle cast fungus decreased for the second consecutive year in the Northeastern Region.

Foliar infection was light in all areas examined except in Lumsden Township, Sudbury District, where moderate-to-severe damage was recorded in a 0.5-ha jack pine stand and in Obatanga Provincial Park, Wawa District, where 20% defoliation occurred on a small number of juvenile jack pine trees.

Although the pathogen attacks only the previous year's foliage, repeated heavy infection does cause retarded tree growth.

Western Gall Rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirats.

General surveys in many jack pine stands over the past three years show a continued increase in the distribution and incidence of this gall-forming pathogen in the Northeastern Region.

In 1985, disease evaluations were conducted in six jack pine stands where infection was known to occur. Levels of infection ranged from 0.3% to 18.0% in these stands; however, no tree mortality was evident (Table 11).

This pathogen is capable of causing heavy branch mortality on trees in all age classes and whole-tree mortality in stands of young jack pine regeneration when branches or stems become girdled by the gall. In young stands, stems up to 5 cm in diameter are often girdled, and the part of the stem and branches beyond the gall is thereby killed.

Table 11. Summary of damage by the western gall rust in the Northeastern Region in 1985 (counts based on the examination of 150 or 300 randomly selected jack pine trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)	Trees[b] severely affected (%)
Wawa District					
Maness	25	2,000	10.0	1.3	0.0
Blind River District					
Haughton	50	3,000	3.0	18.0	8.6
Rose	50	3,000	7.0	2.0	0.0
Villeneuve[a]	20	2,000	2.2	0.6	0.0
Sudbury District					
Hendrie[a]	50	1,500	3.5	0.3	0.0
Rowat	100	4,000	1.7	0.6	0.0

[a] 300-tree sample
[b] stem galls

Shoot Blight, *Venturia macularis* (Fr.) E. Müller and v. Arx

Evaluations to determine the incidence of this disease and damage caused by it were conducted in aspen regeneration stands at four points. The data obtained show significant increases over the previous year in the number of trees infected and in the incidence of leader mortality (Table 12). Leader mortality averaged 24.6% in 1985 in comparison with 7.9% in 1984. Repeated leader attack causes a 'stag-headed' condition on affected trees and in some instances tree mortality occurs. Varying degrees of infection were observed on roadside and fringe regeneration aspen at scattered points elsewhere in the Region.

Table 12. Summary of damage caused by shoot blight in natural regeneration at four locations in the Northeastern Region from 1983 to 1985 (counts based on the examination of 150 randomly selected aspen trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)			Leader mortality (%)		
				1983	1984	1985	1983	1984	1985
Wawa District									
Dunphy	10	5,000	2.0	4.6	32.6	50.6	4.6	20.6	30.0
Blind River District									
Villeneuve	25	5,000	2.0	0.7	5.3	44.6	0.7	0.7	23.3
Parkinson	25	5,000	2.3	1.3	7.3	59.3	0.0	2.6	34.0
Sudbury District									
Antrim	20	200	2.4	-	-	11.3	-	-	11.3

Table 13. Other forest diseases.

Organism	Host(s)	Remarks
Cronartium sp.	jP	Stem cankers were recorded on 4% of 2-m jack pine trees examined in a 15-ha plantation in Rowat Township, Espanola District; trace damage was evident in Dowling Township, Sudbury District.
Cronartium ribicola J.C. Fischer ex Rabenh. White pine blister rust	wP	25% infection of roadside regeneration recorded at one point in the Wawa District
Lophodermella concolor (Dearn.) Darker Needle cast	jP	moderate damage on one tree in Merrick Township, North Bay District
Lophodermium seditiosum Minter et al. Needle cast	rP	low infection recorded on 3-m trees in Olrig Township, North Bay District
Lophophacidium dooksii Corlett and R. Shoem. Needle blight	wP	90% of the current foliage affected on single trees in Blind River and North Bay districts
Mycosphaerella populorum G.E. Thompson Leaf spot	bPo	low incidence along roadside at one point in Sault Ste. Marie District
Sphaeropsis sapinea (Fr.) Dyko and B. Sutton Tip blight	rP, wP	light damage observed on scattered trees in Samuel de Champlain Provincial Park, North Bay District

ABIOTIC DAMAGE

Leaf Scorch

Surveys in hardwood stands revealed varying degrees of leaf scorch caused by climatic conditions at widely scattered locations along the north shore of Lake Huron in Sault Ste. Marie, Blind River and Espanola districts. Damage was generally light except in the Espanola District, where two species of anthracnose were found in association with leaf scorch in Mills and Billings townships. Severe damage to 100% of the foliage of red oak, sugar maple and occasionally white elm *(Ulmus americana* [L.]) was evident at scattered points in these townships.

Leaf scorch causes dead brownish areas along margins and between veins; however, the leaves remain alive. Anthracnose, on the other hand, causes brownish spots along the main vein which rapidly become enlarged and form necrotic areas, causing shrivelling and premature foliage drop.

Ice and Wind Damage

In November 1984, an ice storm accompanied by high winds caused light-to-moderate damage through approximately 600 ha of plantations in the Kirkwood Management Unit in the Blind River District. The most serious damage was noted in pine plantations, especially those in which thinning programs had been carried out. Broken branches, tops and stems were commonly observed in many of these stands and in many instances trees were bent to a near-horizontal position.

In the spring of 1985, high winds caused extensive damage to tender foliage of trees of several deciduous species, especially maples and birches through the southern half of the Sault Ste. Marie and Blind River districts. Trees on high hills and ridge tops sustained as much as 75% foliar damage on the upper crowns. Leaves were torn or shredded and in some instances the uppermost crowns of yellow birches *(Betula alleghaniensis* Britton) were denuded of foliage.

Other Abiotic Damage

Up to 25% of the foliage was killed on red pines in approximately 400 ha of a plantation in the Kirkwood Management Unit. The cause is unknown.

Light frost damage was evident on 100% of the trees in a 10-ha white spruce *(Picea glauca* [Moench] Voss) plantation in Haughton Township, Blind River District.

Heavy salt damage was sustained by white pine *(Pinus strobus* L.) and red pine trees along roadsides at scattered points in the North Bay District.

SPECIAL SURVEYS

Jack Pine Plantation Survey

Special surveys have been conducted in plantations and high-value stands of various tree species over the past several years to determine the status of insect and disease pests. In 1985, as well as in 1982, jack pine was chosen for the survey. Thirteen stands were sampled in the Region in three height classes: < 2 m, 2-6 m, and >6 m (Fig. 8). In addition, increment core samples were obtained in 1985 from 20 trees in each of the four stands >6 m to determine the incidence of root or butt rot in trees in this height class. Each stand was surveyed twice for specific insects and diseases listed below:

Insects: Sawflies, *Neodiprion* spp., jack pine budworm, white pine weevil, eastern pine shoot borer, jack pine tip beetle and Swaine jack pine sawfly.

Diseases: Pine needle rust, Coleosporium asterum (Dietel) Sydow, Scleroderris canker, western gall rust, stem rusts, *Cronartium* spp., needle cast and Armillaria root rot.

All insect and disease pathogens mentioned above, with the exception of the Swaine jack pine sawfly, were observed in the survey and are summarized in Table 14.

No stem rust of pine could be found. Positive results of other disease pathogens that were recorded are presented in Table 15.

The survey in 1985 detected only a trace of jack pine sawfly defoliation at one point, similar to that recorded in the 1982 survey. Damage caused by defoliation was negligible.

A marked increase in the incidence of jack pine budworm was recorded in these plantations in comparison with that recorded in a similar survey in 1982. Light defoliation was evident at five of the sample points; only a trace population was recorded at one point in the previous survey.

White pine weevil populations have generally remained at a low level in jack pine stands over the past several years. The surveys carried out in 1985 and 1982 each revealed low populations at six points. The incidence of weeviling averaged 2.1% in 1985 and 1.3% in 1982.

Leader damage by the eastern pine shoot borer was recorded at five points in the 1985 survey and at one point in the previous survey. Numbers of attacks averaged 1.0% in 1985 and 4.0% in 1982. The insect also damages lateral shoots; however, this damage is considered to be

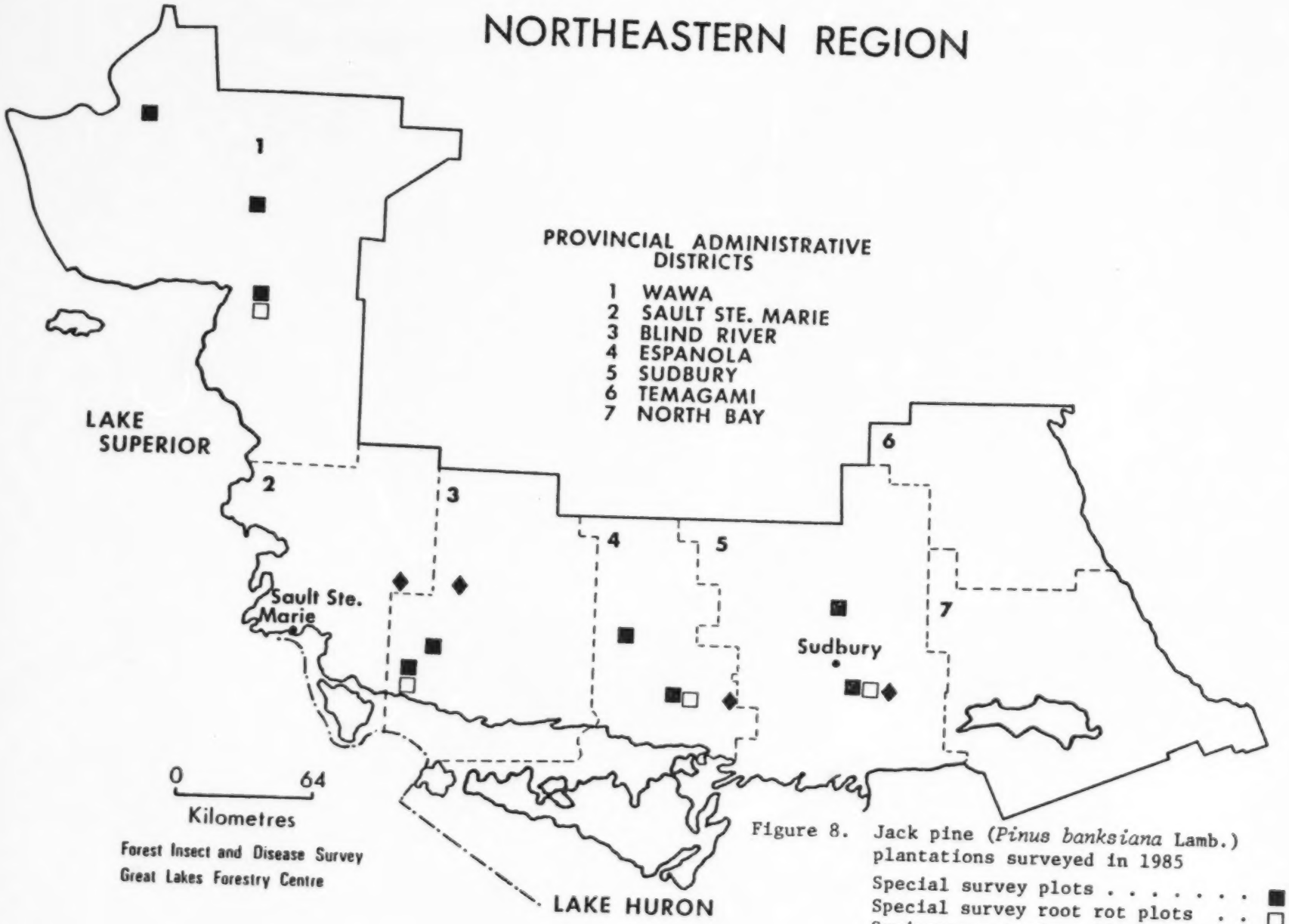


Figure 8. Jack pine (*Pinus banksiana* Lamb.) plantations surveyed in 1985

Special survey plots . . . . . ■
Special survey root rot plots . . □
Semipermanent plots 1982-1985 . . ◆

Table 14. Summary of the incidence of insect-caused damage noted in a survey conducted in jack pine plantations in the Northeastern Region in 1985 (counts based on the examination of 150 or 300 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	White pine weevil	Eastern pine shoot borer		Jack pine tip beetle	Jack pine budworm	Red pine[a] sawfly
				Leaders attacked (%)	Leaders attacked (%)	Lateral shoots attacked (%)	Leaders attacked (%)	Trees infested (%)	Trees infested (%)
Wawa District									
Cecile	20	3,000	1.4	0.0	0.0	0.0	2.6	36.6	0.0
Huotari	50	3,500	5.0	0.0	0.0	0.0	0.0	0.0	0.0
Manese	25	2,000	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Sault Ste. Marie District									
Hurlburt[b]	50	5,000	2.2	3.0	0.0	0.3	0.0	0.0	0.0
Blind River District									
Villeneuve[b]	20	3,000	2.0	2.3	1.0	0.0	0.6	0.0	0.0
Haughton	50	3,000	3.0	2.0	0.6	1.3	1.3	0.0	0.0
Rose	50	3,000	7.0	0.0	0.0	0.0	0.0	0.0	0.0
Espanola District									
Nairn[b]	24	5,000	2.8	1.6	0.3	0.0	0.0	2.0	0.0
Rowat	100	4,000	1.7	0.0	2.0	0.0	0.0	15.0	0.0
Shakespeare	25	3,000	11.2	0.0	0.0	0.0	0.0	0.0	0.0
Sudbury District									
Burwash	2	3,000	13.5	0.0	0.0	0.0	0.0	10.0	0.0
Lumsden	20	2,500	1.5	3.3	0.0	2.6	1.3	0.0	
Hendrie[b]	50	3,000	3.5	0.6	1.3	1.0	0.0	18.6	0.3

[a] *Neodiprion nanulus nanulus* Schedl.
[b] 300-tree sample

Table 15. Summary of the incidence of disease-caused damage noted in a survey conducted in jack pine plantations in the Northeastern Region in 1985 (counts based on the examination of 150 or 300 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Armillaria root rot	Pine needle rust	Tar spot needle cast	Western gall rust	Scleroderris canker
				Trees affected (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)
Wawa District								
Cecile	20	3,000	1.4	0.0	0.0	0.0	0.0	0.0
Huotari	50	3,500	5.0	0.0	0.0	0.0	0.6	0.0
Maness	25	2,000	10.0	0.0	0.0	0.0	1.3	0.0
Sault Ste. Marie District								
Hurlburt[a]	50	5,000	2.2	0.0	0.0	1.0	0.0	1.3
Blind River District								
Villeneuve	20	3,000	2.0	0.6	0.6	11.6	0.3	0.0
Haughton	50	3,000	3.0	0.0	0.0	2.0	18.0	0.0
Rose	50	3,000	7.0	0.0	0.0	0.6	3.3	0.0
Espanola District								
Nairn[b]	24	5,000	2.8	0.6	0.0	0.0	0.0	0.0
Rowat	100	4,000	1.7	0.0	0.0	0.0	0.6	0.0
Shakespeare	25	3,000	11.2	0.0	0.0	0.0	0.0	0.0
Sudbury District								
Burwash	2	3,000	13.5	0.0	0.0	0.0	0.0	0.0
Lumsden	20	2,500	1.5	0.0	0.0	4.6	0.0	0.0
Hendrie[b]	50	3,000	3.5	0.3	45.6	0.0	1.3	0.0

[a] 300-tree sample

insignificant in comparison with leader damage, which retards tree growth and affects tree form.

The upper whorl of shoots of jack pine trees was attacked and killed by the jack pine tip beetle at four plantations examined in the 1985 survey. The incidence of attack averaged 1.5% in comparison with an average of 1.0% attack at two points. The incidence of attack averaged 1.5% in comparison with an average of 1.0% attack at two points examined in the previous survey.

The survey revealed needle rust infection on an average of 23.1% of the trees examined at two points. Foliar damage averaged 5%, whereas only a trace of damage by this pathogen was observed at two points in surveys conducted in 1982.

Light damage by Scleroderris canker (North American race) was recorded at one point, marking a decrease in the incidence of infection over that recorded in the previous survey when the pathogen was recorded at three points. The incidence of infection was 1.3% in the infected stand.

General surveys over the past three years indicate that the incidence of the western gall rust seems to be increasing in the Northeastern Region. This was further substantiated when the pathogen was recorded in 7 of 13 stands surveyed in 1985. The disease was recorded in only 2 of 13 stands examined in a similar survey in 1982. The incidence of infection wnere the pathogen was found in 1985 ranged from 0.3% to 18.0% and averaged 3.6%.

Galls girdle and kill young trees. Anyone associated with regeneration projects should watch for mortality of this type.

Trace damage by Armillaria root rot was recorded at two points in 1982 and at three points in 1985 in the above-mentioned surveys. The average incidence of infection was recorded at 1.0%.

In 1985, foliar damage caused by tar spot needle cast infection was recorded on an average of 4.9% of the trees at five of the sample points in comparison with 21.7% of the trees at four points examined in the 1982 survey. In all instances damage was light.

Sampling to determine the incidence of root and butt rots in stands 6 m or over was carried out in four stands in conjunction with the above survey. Increment core samples extending through the butt of the tree, 15 cm above ground level, were taken from 20 randomly selected trees at four points. There was no evidence of root or butt rot in any of the cores--an indication that this type of problem is not common.

Semipermanent Jack Pine Plots

In the early spring of 1982, semipermanent sample plots were established in four juvenile jack pine plantations in the Northeastern Region (see Fig. 8). A special survey to determine the presence of insects and disease pathogens in the plots has been carried out annually in mid-June and mid-August. In addition, current tree growth has been measured and annual mortality rated.

The most important insect pests detected in the survey were the white pine weevil and jack pine budworm. Populations of the white pine weevil fluctuated at low levels in each sample plot. Records show that the incidence of weevil attack ranged from 0.6% to 6.0% and averaged 2.1% over the four years. Low populations of the jack pine budworm were also recorded in each sample plot at least once in the four years when sampling was carried out; however, defoliation was negligible. Low populations of the eastern pine shoot borer and northern pitch twig moth *Petrova albicapitana* (Busck), were also recorded in each sample area. The incidence of attack by these insects averaged 0.5% and 0.6%, respectively. Light damage caused by the jack pine tip beetle was observed in three of the four sample plots. The incidence of attack averaged 0.3% over the four years (Table 16). Only occasional traces of defoliation by *Neodiprion* sawflies were observed; therefore, these pests are excluded from the table. No tree mortality caused by insect feeding was evident.

The disease pathogens that the survey was designed to evaluate were recorded at low levels in one or more of the sample plots over the four-year period (Table 17). The pathogens capable of causing the most serious damage were Armillaria root rot and Scleroderris canker. The incidence of Armillaria root rot infection ranged from 0.3% to 0.7%. Little change in the incidence of Scleroderris canker occurred in the Hurlburt Township sample plot, where it was first recorded in 1984. Other less destructive diseases found at low levels in the survey were: pine needle rust and western gall rust in three areas, and tar spot needle cast in two.

In conjunction with the above surveys, the growth of the sample trees was measured each year. The data obtained revealed that the average leader growth was 40.3 cm per year over the four-year period (Table 18).

Jack Pine Cone and Seed Survey

In recent years surveys have been conducted to determine the influence of insects and diseases on the seed crop of coniferous trees. In 1985, jack pine cones were chosen for examination. Collections of 100 cones were made in early July in Rose, Merritt and Strathcona townships in the Blind River, Espanola and Temagami districts, respectively. The samples were assessed to determine the proportion of cones damaged, seed loss, and the identity of insects or diseases responsible.

Table 16. Summary of the incidence of insect-caused damage noted in a survey conducted in semipermanent sample plots in four jack pine plantations in the Northeastern Region from 1982 to 1985 (counts based on the examination of 300 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Year	Avg ht of trees (m)	White pine weevil	Eastern pine shoot borer	Jack pine tip beetle	Northern pitch twig moth	Jack pine budworm	Mortality (%)
					Leaders attacked (%)	Leaders attacked (%)	Leaders attacked (%)	Trees infested (%)	Trees infested (%)	
Sault Ste. Marie District										
Hurlburt	50	5,000	1982	0.7	1.0	0.0	0.0	0.0	9.3	0.0
			1983	1.1	1.3	0.0	0.0	0.0	0.0	0.0
			1984	1.6	3.6	0.7	0.0	0.3	4.0	0.0
			1985	2.2	3.0	0.0	0.0	0.0	0.0	0.0
Blind River District										
Villeneuve	20	3,000	1982	0.7	0.0	0.0	0.0	0.0	0.0	0.0
			1983	1.1	0.7	1.0	2.3	6.0	0.0	0.0
			1984	1.5	1.6	0.0	1.6	0.6	0.3	0.0
			1985	2.0	2.3	1.0	0.6	0.0	0.0	0.0
Espanola District										
Nairn	24	5,000	1982	1.4	2.0	0.0	1.0	0.0	0.0	0.0
			1983	1.8	4.7	0.0	0.0	1.0	0.0	0.0
			1984	2.3	6.0	0.0	0.0	1.0	2.7	0.0
			1985	2.8	1.6	0.3	0.0	0.0	0.0	0.0
Sudbury District										
Hendrie	50	3,000	1982	1.9	0.0	4.0	0.0	0.0	0.0	0.0
			1983	2.5	4.0	0.7	0.0	1.0	0.0	0.0
			1984	3.0	2.3	0.0	0.3	0.3	0.0	0.0
			1985	3.5	0.6	1.3	0.0	0.0	18.6	0.0

Table 17. Summary of the incidence of disease-caused damaged noted in a survey conducted in semipermanent sample plots in four jack pine plantations in the Northeastern Region from 1982 to 1985 (counts based on the examination of 300 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Year	Avg ht of trees (m)	Armillaria root rot	Pine needle rust	Tar spot needle cast	Western gall rust	Scleroderris canker	Mortality (%)
					Trees affected (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)	
Sault Ste. Marie District										
Hurlburt	50	5,000	1982	0.7	0.0	1.3	0.0	0.0	0.0	0.0
			1983	1.1	0.7	0.0	0.0	0.0	0.0	0.7
			1984	1.6	0.0	0.0	0.0	0.0	0.0	0.0
			1985	2.2	0.0	0.0	1.0	0.0	1.3	0.3
Blind River District										
Villeneuve	20	3,000	1982	0.7	0.0	1.0	2.0	0.0	0.0	0.0
			1983	1.1	0.0	0.0	0.0	0.0	0.0	0.0
			1984	1.5	0.0	0.6	6.0	0.0	0.0	0.0
			1985	2.0	0.7	0.6	11.6	0.3	0.0	0.7
Espanola District										
Nairn	24	5,000	1982	1.4	0.0	0.0	0.0	0.0	0.0	0.0
			1983	1.8	0.0	0.0	0.0	0.0	0.0	0.0
			1984	2.3	0.3	0.0	0.0	0.3	0.0	0.3
			1985	2.8	0.7	0.0	0.0	0.0	0.0	0.7
Sudbury District										
Hendrie	50	3,000	1982	1.9	0.0	0.0	0.0	0.0	0.0	0.0
			1983	2.5	0.7	0.0	0.0	0.0	0.0	0.7
			1984	3.0	0.3	5.0	0.0	1.0	0.0	0.3
			1985	3.5	0.3	45.6	0.0	1.3	0.0	0.3

Table 18. Summary of the height growth of jack pine trees in four semi-permanent sample plots in the Northeastern Region, 1982-1985 inclusive (measurements based on the examination of 300 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg annual height growth (m) 1982-1984
Sault Ste. Marie District			
Hurlburt	50	5,000	0.42
Blind River District			
Villeneuve	20	3,000	0.37
Espanola District			
Nairn	24	5,000	0.36
Sudbury District			
Hendrie	50	3,000	0.45

The assessment revealed that the incidence of damaged cones was 7%, 26% and 16%, and seed loss averaged 47%, 28%, and 38%, respectively, in the previously mentioned districts (Table 19). The largest portion of seed loss was caused by an unknown agent, followed by Lepidopterous species, *Resseliella* sp., *Eucosma* sp., the fir coneworm, *Dioryctria abietivorella* (Grt.) and the jack pine budworm. No diseases were recorded in the sample.

Table 19. Summary of the incidence of insect damage and seed loss in jack pine cones in the Northeastern Region in 1985 (counts based on the examination of 100 randomly selected jack pine cones from three trees at each location).

Location (Twp)	Avg no. of seeds per sound cone	Cones damaged (%)	Avg seed loss in damaged cones (%)	Cones affected by insects					
				Rhyacionia species (%)	Lepidopterous (%)	Fir coneworm (%)	*Eucosma* species (%)	Jack pine budworm (%)	Unknown (%)
Blind River District									
Rose	37	7	47	4	1	1	0	0	1
Espanola District									
Merritt	36	26	28	1	3	0	1	1	20
Temagami District									
Strathcona	36	16	38	0	8	2	0	0	5

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

Over the past six years, special surveys have been carried out to determine the presence and distribution of this pest of pines in Ontario.

In 1985, samples were taken from suspect trees at 46 locations in the Northeastern Region and submitted to the GLFC for analysis. This study revealed that two samples, taken in Boulter and Scollard townships in the North Bay and Sudbury districts, respectively, were affected by the above species, 29 had nematodes and these are in process of identification, and 15 were free of nematode populations (Fig. 9). All of the affected samples were forwarded to the Biosystematics Research Institute, Ottawa, Ontario, for further analysis to identify and confirm the species present. The results of the study are incomplete at this date.

The nematodes are transferred to healthy trees in early summer by adult sawyer beetles, *Monochamus* spp feeding on twigs and branches after migrating from infested trees. The nematodes multiply rapidly in the host, disrupting the flow of sap within the tree and causing the foliage to wilt. Trees usually succumb in late summer or fall of the same year.

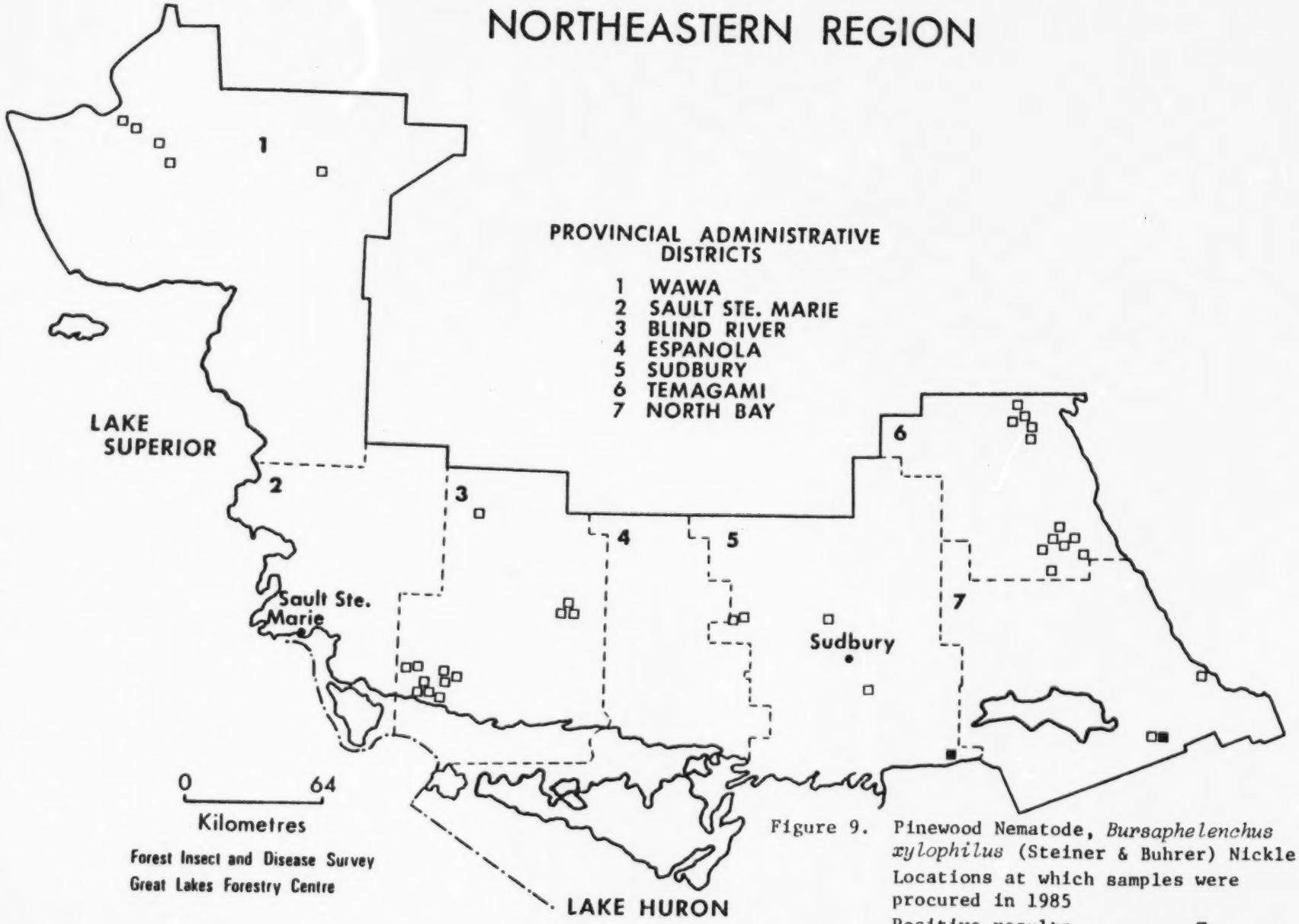


Figure 9. Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle
Locations at which samples were procured in 1985
Positive results . . . . . ■
Negative results . . . . . □

Acid Rain National Early Warning System (ARNEWS)

As part of a national early warning system to detect and monitor the effects of acid rain on the forest, the FIDS Unit established study plots at various locations in the province in 1984 and 1985. Each plot was established on land reserved for studies of acid rain symptoms and damage over extended periods.

In the Northeastern Region, four monitor plots were established, three in mixed hardwood stands in Wishart, Hyman and Calvin townships in the Sault Ste. Marie, Sudbury and North Bay districts, respectively, and the fourth in a pure jack pine stand in Huotari Township, Wawa District.

Each plot is monitored at specific intervals in the spring, summer and fall of each year to determine the incidence of damage caused by acid rain, insects and disease pathogens and changes, if any, in the structure of the stand.

No damage caused by acid precipitation or changes in stand structure could be determined in the areas studied this year. The insect and disease surveys carried out in the plots revealed light defoliation by the basswood looper, *Erannis tiliaria* (Harr.), in the Wishart Township plot and traces of the forest tent caterpillar in the Wishart and the Hyman townships plots. Small numbers of the aspen twoleaf tier, *Enargia decolor* (Wlk.) and the American aspen beetle, *Gonioctena americana* (Schaef.), were recorded in the Calvin Township plot as well. The incidence of disease pathogens was negative in all plots but abiotic damage was recorded in the Wishart Township plot where light leaf scorch was evident on small regeneration sugar maples.

Climatic Data

Weather plays an important role in the development of insects, diseases and tree growth. Certain weather conditions can create favorable conditions for our forests or predispose them to damage, and can be the cause of marked fluctuations of insect populations or disease incidence. Adverse weather conditions cause abiotic damage such as frost, winter drying or scorch, breakage due to wind, snow or hail damage and drought. Weather data for three locations across the Region are recorded in Table 20. This table includes the monthly mean temperature, total precipitation and 1985 deviation from the 30-year normals.

More detailed weather information can be obtained from local Atmospheric Environment Service weather offices.

Table 20. Summary of mean temperature, total precipitation and deviation from the norm for the year 1985 for three locations across the Northeastern Region.

Location	Month	Mean temperature (°C)		Deviation from norm (°C)	Total precipitation (mm)		Deviation from norm (%)
		Normal	Actual		Normal	Actual	
Sault Ste. Marie District	January	-10.1	-11.1	-1.0	74.0	86.6	+17.0
	February	-10.0	-11.1	-1.1	68.0	87.2	+28.2
	March	-5.1	-2.8	+2.3	60.4	79.3	+31.3
	April	3.1	3.3	+0.2	64.4	121.2	+88.2
	May	9.1	10.5	+1.4	84.2	128.0	+52.0
	June	14.6	12.6	-2.0	74.3	49.3	-33.6
	July	17.3	16.0	-1.3	55.6	58.3	+ 4.9
	August	16.9	16.5	-0.4	82.7	122.8	+48.5
	September	12.8	13.8	+1.0	95.3	81.2	-14.8
	October	7.6	7.7	+0.1	74.2	83.7	+12.8
	November	0.7	0.2	-0.5	93.3	103.2	+10.6
	December	-6.7	-9.6	-2.9	79.6	128.0	+60.8
Sudbury District	January	-13.7	-15.3	-1.6	57.5	50.1	-12.9
	February	-12.5	-11.0	+1.5	47.0	107.7	+129.1
	March	-6.0	-5.4	+0.6	55.2	94.4	+71.0
	April	2.7	3.1	+0.4	61.1	88.5	+44.8
	May	10.5	11.2	+0.7	67.1	52.4	-21.9
	June	16.0	14.1	-1.9	82.8	42.0	-49.3
	July	18.7	17.6	-1.1	83.1	148.3	+78.5
	August	17.3	17.1	-0.2	82.9	63.0	-24.0
	September	12.2	13.6	+1.4	106.5	69.2	-35.0
	October	6.3	6.9	+0.6	74.6	66.7	-10.6
	November	-1.2	-2.1	-0.9	77.8	90.8	+16.7
	December	-10.2	-13.2	-3.0	65.0	73.5	+13.1
North Bay District	January	-13.0	15.6	-2.6	63.5	37.2	-41.4
	February	-11.3	9.8	+1.5	56.2	72.8	+29.5
	March	-5.3	5.5	-0.2	61.1	115.7	+89.4
	April	3.2	2.9	+0.3	62.3	90.2	+44.8
	May	10.6	10.7	-0.1	69.3	63.5	- 8.4
	June	15.7	13.7	+2.0	85.1	77.4	- 9.0
	July	18.3	17.1	+1.2	102.4	167.4	+63.5
	August	17.0	16.7	+0.3	98.7	42.6	-56.8
	September	12.2	13.5	+1.3	115.9	82.1	-29.2
	October	6.4	6.8	+0.4	87.7	82.6	- 5.8
	November	-1.0	-1.7	-0.7	86.6	86.5	- 0.1
	December	-9.7	-12.2	-3.5	75.4	72.8	- 3.4